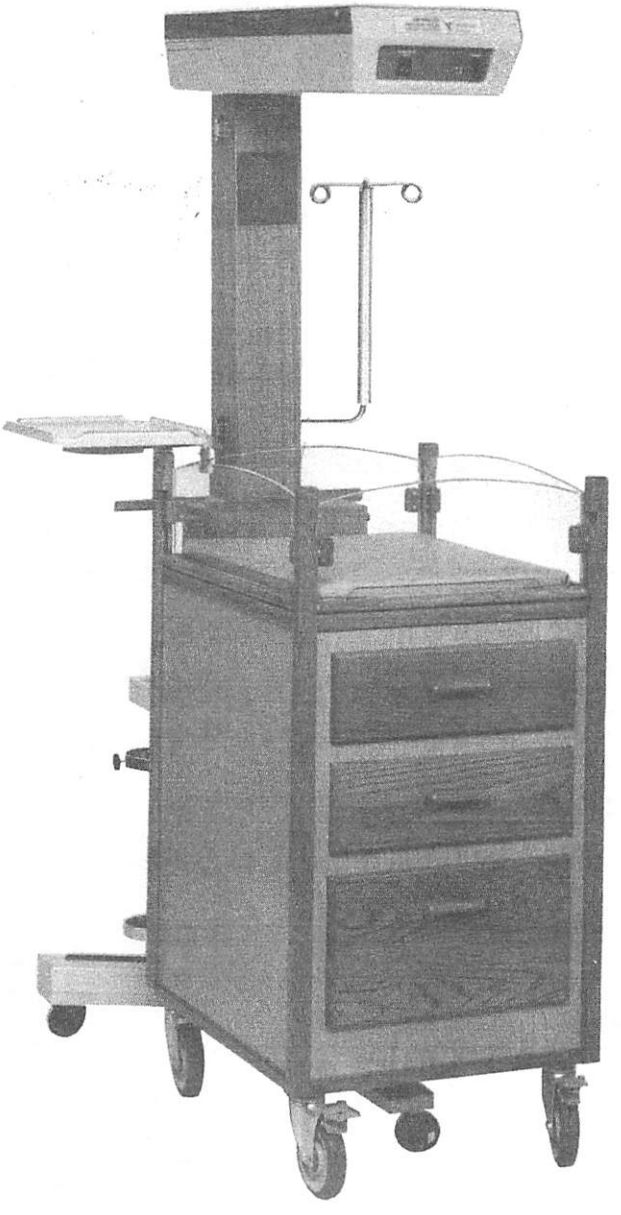
SERVICE MANUAL



AIR–SHIELDS®
BIRTHING ROOM WARMER
SYSTEM 7865

Air-Shields Vickers Medical

LIMITED

WARRANTY

The product being described in this manual is warranted against defects in materials or workmanship for one year from the date of shipment from Air–Shields, Hatboro, with the following exceptions.

All consumable and disposable products are guaranteed to be free from defects upon shipment only.

Calibrations are considered normal maintenance and are not included in the 1 year warranty.*

During the warranty period any defective parts other than those listed above will be replaced at no charge to the customer. There will be no labor charge for replacing the parts within the continental U.S

1. Damage to the unit is incurred as a result of mishandling.
2. The customer fails to maintain the unit in a proper manner.
3. The customer uses any parts, accessories, or fittings not specified or sold by Air–Shields.
4. Sale or service is performed by a non–certified service/dealer agency.

This warranty is in lieu of all other warranties, expressed or implied, and Air–Shields shall in no event be liable for incidental or consequential damages including loss of use, property damage, or personal injury resulting from breach of warranty.

*The Accreditation Manual for Hospitals requires each piece of equipment to be tested prior to initial use and at least annually thereafter. To comply with this standard, we recommend that you participate in our Accreditation Testing Compliance Program during the warranty period. This service can be performed by certified technicians through our Product Service Group and authorized dealers.

SERVICE

For optimal performance, product service should be performed only by qualified service personnel. Product Service Group instrumentation specialists are located throughout the United States and are dispatched for required maintenance by calling 800–523–2404. Customers outside the U.S. should contact their local factory–authorized Air–Shields distributor for service.

Air–Shields Vickers Medical
330 Jacksonville Rd.,Hatboro, PA 19040

Cat. No. 78 991 51–6
E 1 2 3 4 5 6 7 8 9
A (1) 2 3 4 5 6 7 8 9

Printed in U.S.A.	9/87
(Change 1)	3/88
(Change 2)	8/89
(Change 3)	1/91
(Change 4)	10/91
(Change 5)	6/92

PLEASE READ

Please check the A page for change information.

Since Air–Shields conducts a continuous product improvement program, circuit and component improvements are sometimes incorporated into equipment before they can be incorporated into the printed manuals. When this occurs, changed material is provided on separate sheets at the rear of the manual or under separate cover in the form of a change package. Changed material on each page of text is indicated by a vertical bar in the margin next to the changed material, as shown on the right.

THIS MANUAL CONTAINS PROPRIETARY INFORMATION. REPAIRS AND AUTHORIZED MODIFICATIONS SHOULD BE PERFORMED ONLY BY QUALIFIED SERVICE PERSONNEL TO MAINTAIN YOUR WARRANTY AND TO AVOID CREATING SAFETY HAZARDS. WE CANNOT ASSUME RESPONSIBILITY FOR ANY CONDITIONS AFFECTING THE PROPER OPERATION OF THIS EQUIPMENT WHICH MAY RESULT FROM UNAUTHORIZED REPAIR OR MODIFICATION.

NOTE ON REPLACEMENT PARTS

Some parts used in your equipment may be different than those which appear in the Parts List of this manual. This sometimes occurs due to difficulty in parts procurement, but does not alter the function of the equipment. Order the part listed in the Parts List.

NOTE: ALSO SEE PAGE 2.

LIST OF AVAILABLE MODIFICATION KITS

ITEM	DESCRIPTION	PART NO.
1	Remote Alarm Module	78 211 70
2	Audio Transducer Replacement Kit. Provides Controller Model CMB78-1 Series 01 and lower with a new type of audio transducer.	68 903 88

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ii	0	9/87
iii and iv	2	8/89
v and vi	0	9/87
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1–3	1	3/88
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SECTION 1
GENERAL INFORMATION

1.1 GENERAL

This manual provides instructions for installation, maintenance and repair of the Air-Shields® Birthing Room Warmer, System 7865.

1.2 DESCRIPTION

The Air-Shields® Birthing Room Warmer is designed to provide an integrated system that may be used immediately after birth for the care of the newborn. The Birthing Room Warmer consists of a Bassinet/Cart, Warmer Module and a Controller Module which provides manual heat control, monitoring of skin temperature and skin temperature control.

Accessories are available for resuscitation, oxygen delivery, mounting and storage of equipment.

The Birthing Room Warmer Interlocking Bassinet/Cart is detachable so the infant can be transported to another area in the hospital.

1.3 ACCESSORIES

WARMER

- Resuscitation Box (includes)
  - Oxygen Delivery Manifold
  - Airway Pressure Gauge
- Oxygen Delivery System, Yoke and Gauge
- Twin-O-Vac™, Pediatric
- Flowmeter, Without Oxygen Take-Off
- Oxygen Air Tank Holder, D and E Cylinders
- Oxygen Hose Assembly (3 ft.)
- Oxygen Hose Assembly (10 ft.)
- Monitor Shelf Unit
- I.V. Pole
- AC Receptacle Box (Six Outlets)
- Positive Pressure Pediatric Resuscitator
- Remote Alarm Module

1.4 MODEL IDENTIFICATION/SERIES CHANGE

The Air-Shields® Birthing Room Warmer has four data tags which list model identification and series number; the locations of the data tags are as follows:

1. BASSINET/CART: Located inside the bassinet on the left side; relates only to the Bassinet/Cart.

2. WARMER MODULE: Located inside of Power Module well; relates only to the Warmer Module.

3. POWER MODULE: Located on front panel of Power Module; relates only to the Power Module.

4. CONTROLLER: Located on side of Controller; relates only to the Controller.

The following example explains the content of the data tag:

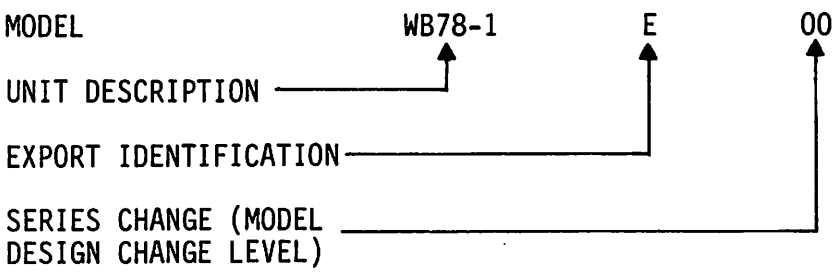

TABLE 1.1 SERIES CHANGE — BASSINET/CART, MODEL CBB78-1

SERIES NO.	DESCRIPTION	ITEMS/ASSEMBLIES AFFECTED
00	Original Design	None

TABLE 1.2 SERIES CHANGE — WARMER MODULE, MODEL WBR78-1

SERIES NO.	DESCRIPTION	ITEMS/ASSEMBLIES AFFECTED
00	Original Design	None

TABLE 1.3 SERIES CHANGE - POWER MODULE, MODEL PM78-1 AND 1E

SERIES NO.	DESCRIPTION	ITEMS/ASSEMBLIES AFFECTED
00	Original Design	None
01	Revise Power Module Assembly to allow interchanging of Controllers without need for recalibration of Controller.	Power Board PCB1 changed from 68 320 70 to 68 320 71. Changed VR1, VR2 and VR3 on Power Chassis.

TABLE 1.4 SERIES CHANGE - CONTROLLER, MODEL CMB78-1

SERIES NO.	DESCRIPTION	ITEMS/ASSEMBLIES AFFECTED
00	Original Design	None
01	Revise Controller Module Assembly. Add circuitry to accommodate Remote Alarm, Model AM78-1.	PCB4 changed from 78 318 70 to 78 318 71.
02	Add Speaker to Motherboard Assembly	PCB4 changed from 78 318 71 to 78 318 72

TABLE 1.5 SERIES CHANGE - APGAR TIMER, MODEL AT78-1

SERIES NO.	DESCRIPTION	ITEMS/ASSEMBLIES AFFECTED
00	Original Design	None

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SECTION 2
INSTALLATION

2.1 UNPACKING

When removing the equipment from the cartons, use care not to scratch or otherwise damage unprotected surfaces; remove all packing materials.

The Birthing Room Warmer is shipped in cartons which contain the following items:

- Warmer Module Assembly
- Upper Mounting Post
- Lower Mounting Post
- Base Assembly
- Docking Bracket
- Controller Assembly and Power Module
- Bassinet/Cart
- Mattress
- Mattress Tray
- Ballast
- Casters for Cart
- Patient Probe
- Handle
- Apgar Timer
- Post Door
- Bumpers
- End and Side Panels

2.2 ASSEMBLY

2.2.1 ASSEMBLY OF UPPER AND LOWER MOUNTING POSTS AND BASE ASSEMBLY

A. REFER TO FIGURE 2.1 and mount the Lower Mounting Post on the Base Assembly using the four mounting bolts and lockwashers supplied.

B. REFER TO FIGURE 2.1 and mount the two weights using the four mounting bolts and lockwashers.

C. REFER TO FIGURE 2.1 and mount the Upper Mounting Post on the Lower Mounting Post and the handle using the four mounting screws and lockwashers supplied.

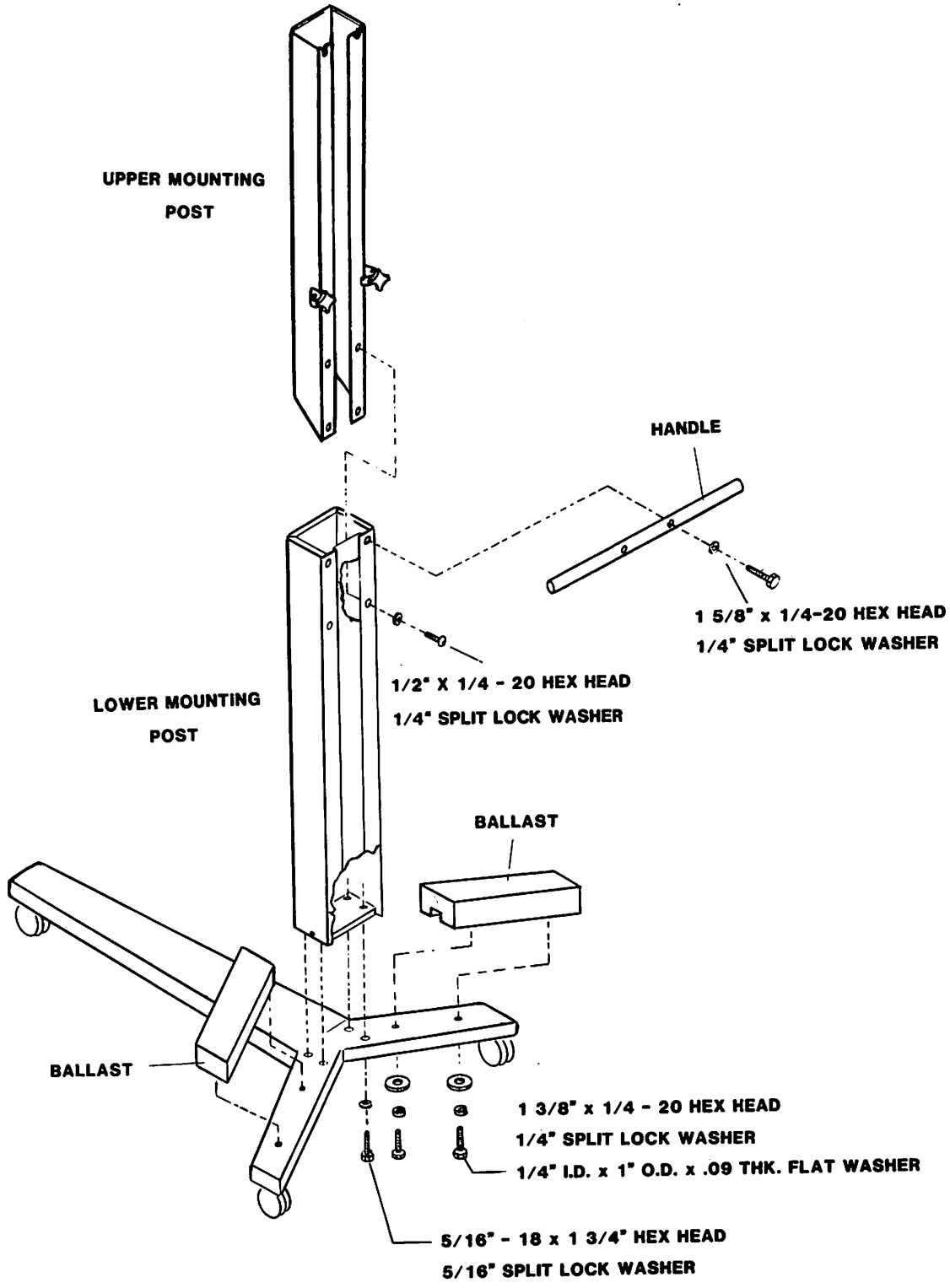

UPPER MOUNTING
POST
HANDLE
1 5/8" x 1/4-20 HEX HEAD
1/4" SPLIT LOCK WASHER
1/2" X 1/4 - 20 HEX HEAD
1/4" SPLIT LOCK WASHER
LOWER MOUNTING
POST
BALLAST
BALLAST
1 3/8" x 1/4 - 20 HEX HEAD
1/4" SPLIT LOCK WASHER
1/4" I.D. x 1" O.D. x .09 THK. FLAT WASHER
5/16" - 18 x 1 3/4" HEX HEAD
5/16" SPLIT LOCK WASHER

FIGURE 2.1 ASSEMBLY OF UPPER AND LOWER MOUNTING POSTS AND BASE ASSEMBLY

2.2.2 INSTALLATION OF POST DOOR

To install the Post Door, refer to Figure 2.2 and proceed as follows:

A. MOUNT THE POST DOOR (1) with the hardware provided (2) on the Front of the Post.

B. MOUNT THE TWO BUMPERS (3) on the post directly across from the hinges.

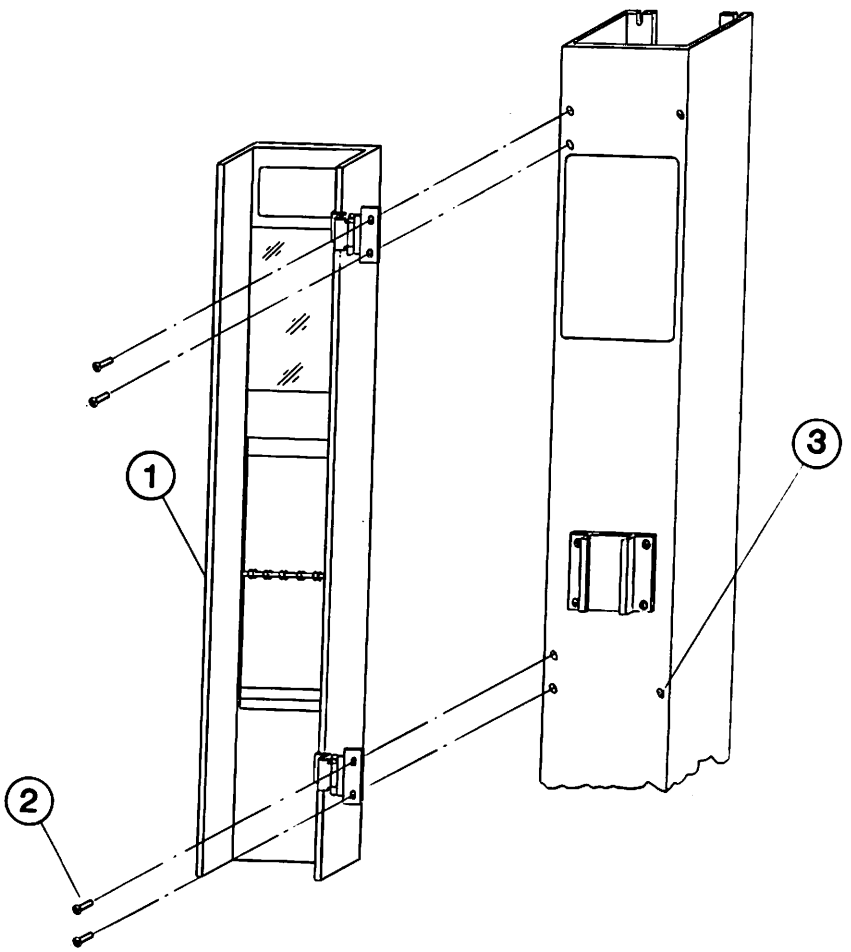


FIGURE 2.2 MOUNTING POST DOOR

2.2.3 INSTALLATION OF WARMER MODULE AND CONTROLLER

To install the Warmer Module on the Mounting Post, refer to Figure 2.3 and proceed as follows:

A. **RAISE THE WARMER MODULE (4)** above the open end of the Mounting Post (5) and insert the interconnecting ribbon cable (6) into the open end of the post.

CAUTION: Use care to prevent damage to the interconnecting ribbon cable when Installing the Warmer Module.

B. **SLOWLY LOWER THE WARMER MODULE MOUNTING** flange into the open end of the Mounting Post. Refer to the illustration below and secure the reinforcing plate (7) and the Warmer Module using the 10 – 32 X 1/2" screws (1) and no 10 lock washers (2) in the upper–most holes.

IMPORTANT: Make sure that the lock washers (2) are directly under the screw heads and are between the screw heads and the outer surface of the Mounting Post.

C. **INSTALL THE POWER CORD CLAMP (8)** on the Power Cord (9); position the clamp 11 inches from the end of the Power Cord.

D. **SECURE THE POWER CORD CLAMP AND POWER CLAMP** to the Mounting Post and reinforcing bracket when installing the two lower–most Warmer Module mounting screws (1) as shown in figure 2.3 and the illustration below. Tighten all mounting screws securely.

NOTE: Raise the front of the Warmer Module slightly when tightening the topmost mounting screws. This will relieve the pressure on the screws and ease the tightening procedure.

E. **OPEN THE DOOR** that covers the mounting post.

F. **CAREFULLY THREAD THE INTERCONNECTING CABLE (6)** out through the Controller opening at the front of the Warmer Module mounting post.

CAUTION:

- **When connecting the Interconneding cable to the Controller, make sure that the cable Is not twisted or crimped.**
- **Make sure that the Interconnecting cable Is dressed down between the circuit board and the back crossmember of the Controller chassis.**

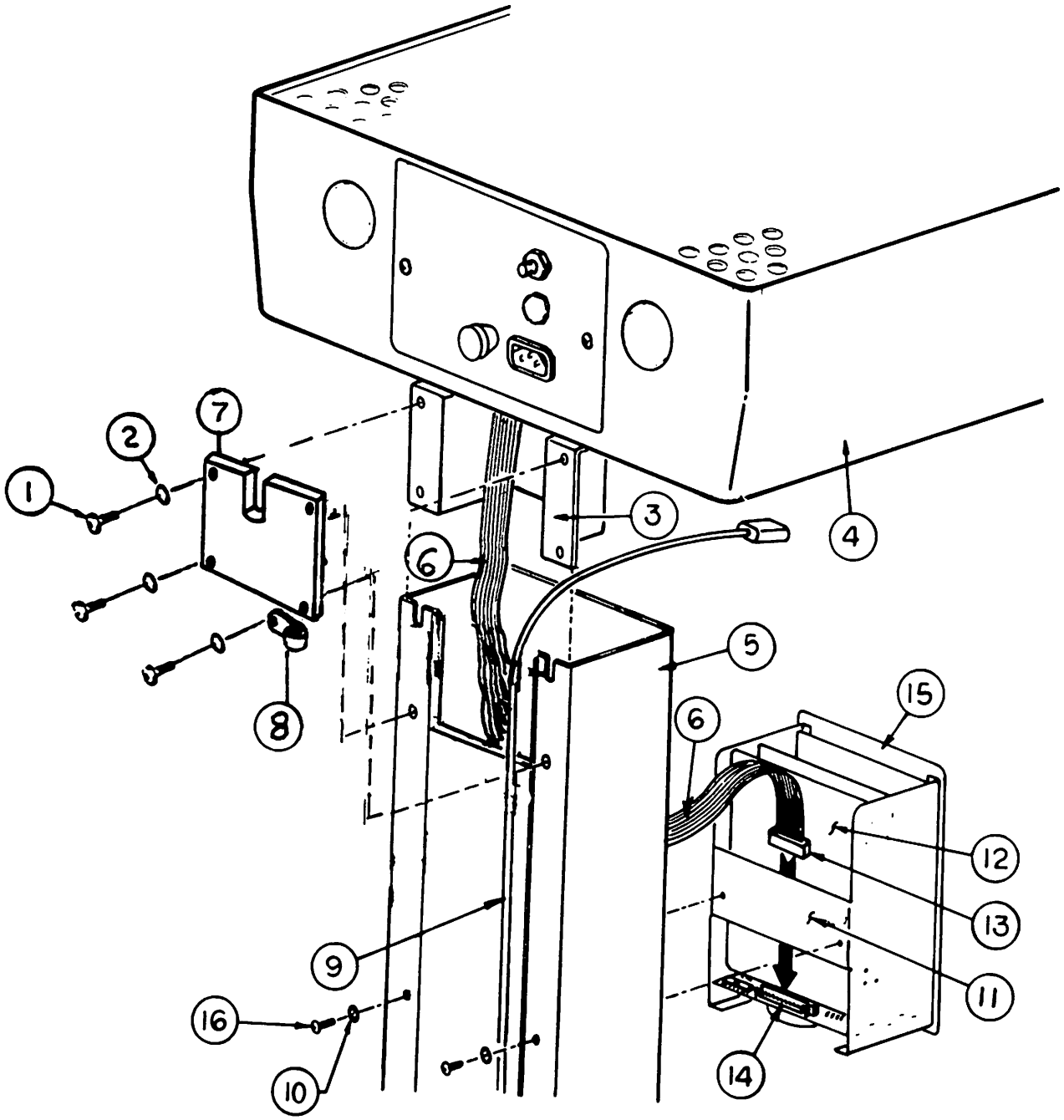


FIGURE 2.3 INSTALLATION OF WARMER MODULE AND CONTROLLER

- **When connecting the interconnecting cable to the Controller, make sure that the key on the cable plug is inserted into the slot on the connector.**

G. CAREFULLY THREAD THE INTERCONNECTING CABLE (6) down between the back cross–member (11) and the circuit board (12) on the Controller and connect the cable plug (13) to the connector (14). Make sure that the key on the plug is inserted into the slot on the connector and is firmly seated.

CAUTION: When Installing the Controller In the Mounting Post, use care not to twist, crimp, pinch, or otherwise damage the Interconnecting cable.

H. CAREFULLY DRESS THE INTERCONNECTING CABLE back into the opening in the Mounting Post, insert the Controller (15) into the opening, and install the Controller mounting screws (16) and lock washers (10).

2.2.4 INSTALLATION OF APGAR TIMER

1. Refer to Section 5 and install the batteries in the APGAR Timer.
2. Mount the Timer on the two shoulder screws under the Controller (Figure 2.4).

FIGURE 2.4 INSTALLATION OF APGAR TIMER

2.2.5 BASSINET/CART ASSEMBLY

To assemble the Bassinet/Cart, refer to Figure 2.6 and proceed as follows:

A. INSTALL THE FOUR CASTERS (1) on the cart using the 3/4 inch nuts and lockwashers (2, 3). Install the two casters with brakes at the front of the cart.

B. INSTALL THE MATTRESS TRAY on the cart. Place the fixed rod on the bottom of the tray in the slot on top of the cart.

C. INSTALL THE MATTRESS IN THE TRAY.

D. INSTALL THE SIDE PANELS in the cart by sliding the bottom plastic pivot pins into the slots of the corner posts (Figure 2.5). Make sure the panel is properly seated (all four pivot pins are in the corner post slots).

   IMPORTANT: The panels must be mounted such that the Warning Label is visible when the panels are down.

E. LOCATE THE EIGHT BUMPERS (4) such that when the panels are down their wooden handles rest on the bumpers and not the wood.

F. PLACE THE DRAWER ORGANIZER in one of the drawers.

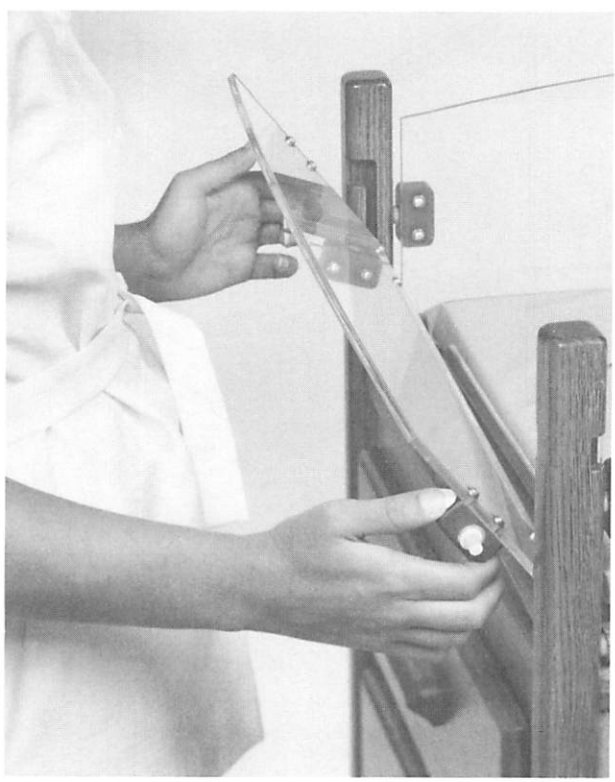


FIGURE 2.5 INSTALLATION OF SIDE PANELS

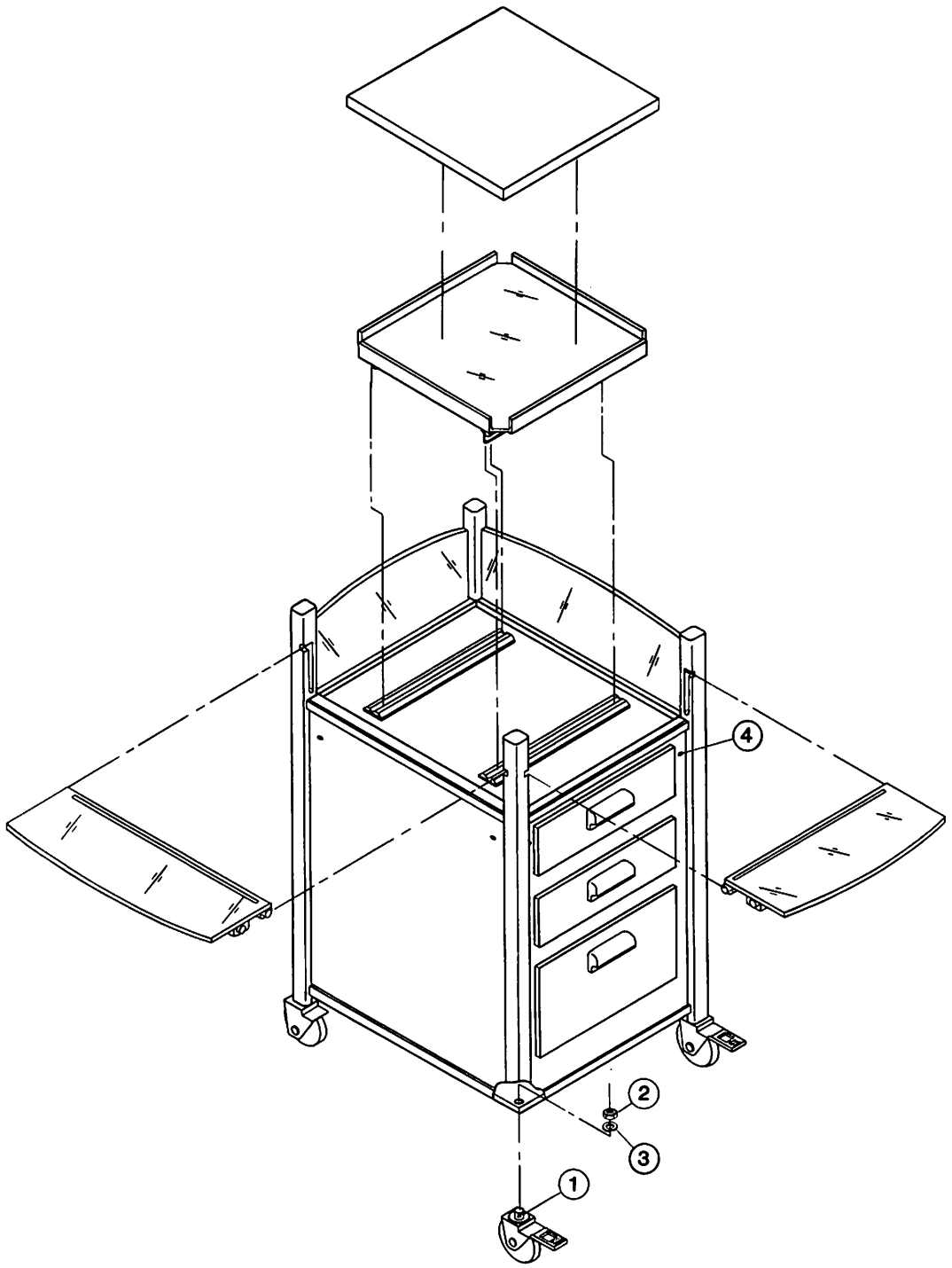


FIGURE 2.6 BASSINET/CART ASSEMBLY

2.2.6 INSTALLATION OF DOCKING BRACKET

To install the Docking Bracket on the Mounting Post, refer to Figure 2.7 and proceed as follows:

A. INSTALL THE DOCKING BRACKET (1) using the four 1/4 x 20 hex head screws (2) and washers (3) provided on the front of the mounting post. Do not tighten the screws.

B. ATTACH THE BASSINET/CART TO THE DOCKING BRACKET. Adjust the height of the Docking Bracket until its top surface is 27-3/4 ± 1/16
inches from the floor.

C. TIGHTEN THE HEX HEAD SCREWS.

D. ADJUST THE DRAWHOOK LATCH TENSION by turning the drawhook clockwise to increase tension or turning the drawhook counterclockwise to decrease tension.

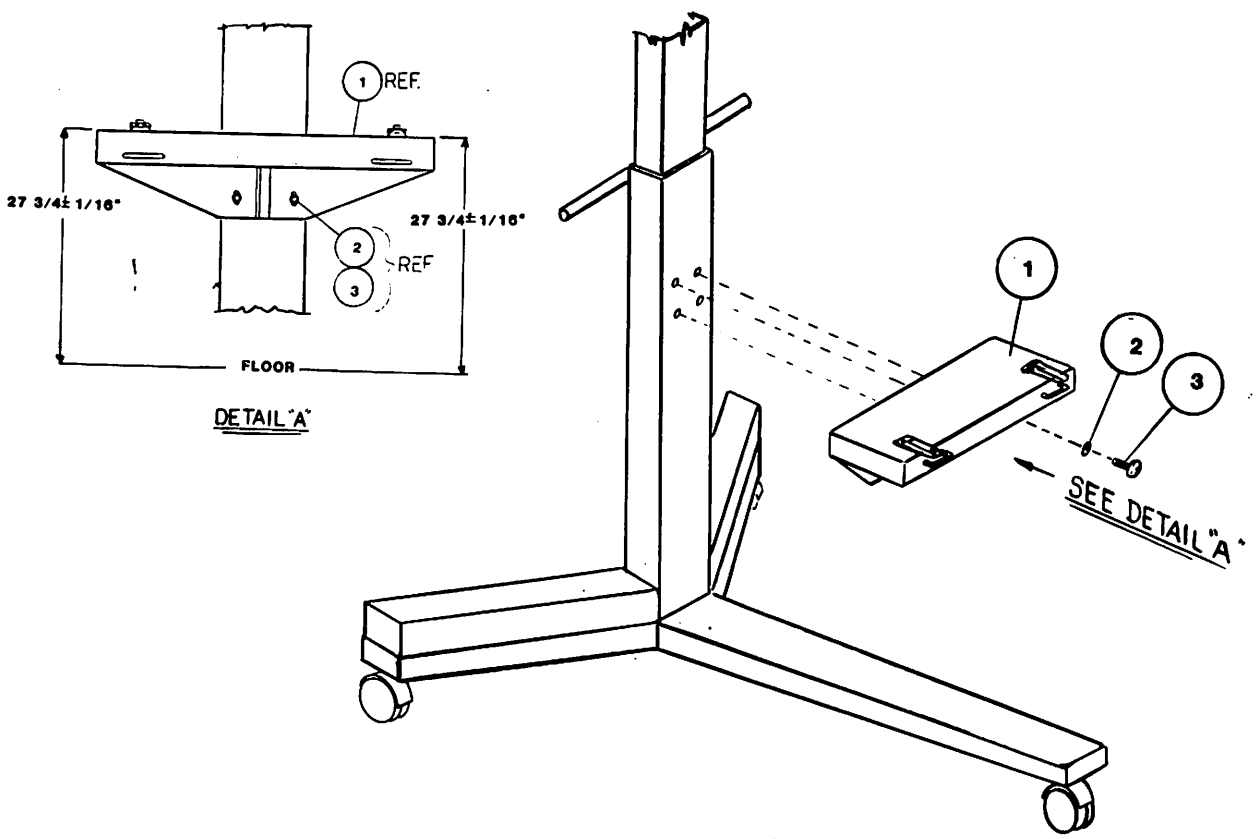


FIGURE 2.7 INSTALLATION OF DOCKING BRACKET

2.3 OPERATIONAL CHECKOUT PROCEDURE

WARNING: The equipment should not be used if it fails to function properly. Service should be referred to qualified personnel.

The operational checkout procedure should be performed before the Birthing Room Warmer is first placed into use and after any disassembly for cleaning or maintenance. To operate the equipment, refer to Figure 4.1 and Table 4.1 of the Operator's Manual for descriptions of controls, indicators, and connectors, and proceed as follows:

ELECTRICAL CHECKOUT

The Electrical Checkout consists of an automatic test of the audible indicator that takes place when primary power is applied to the equipment and a series of operator initiated checks. Refer to qualified service personnel if the unit does not perform as follows:

NOTE: The Alarm Test portion of the automatic test sequence tests the alarms by simulating a functional failure.

CAUTION: Make sure that the building power source is compatible with the electrical specifications shown on the unit. For proper grounding reliability, connect the power cord only to a properly marked hospital grade receptacle. Do not use extension cords. If any doubt exists as to the grounding connection, do not operate the equipment.

A. CONNECT THE POWER CORD to a primary source of the proper voltage and frequency.

B. SET THE CONTROL MODE SWITCH TO SKIN POSITION and connect the Patient Probe to the PATIENT PROBE connector.

C. TURN POWER ON by depressing the WARMER switch on the Warmer Module; the SKIN Mode indicator should light. The following automatic test sequence should occur (refer to the label below):

   NOTE: During the automatic test sequence, disregard other extraneous displays or indications which may occur within this sequence.

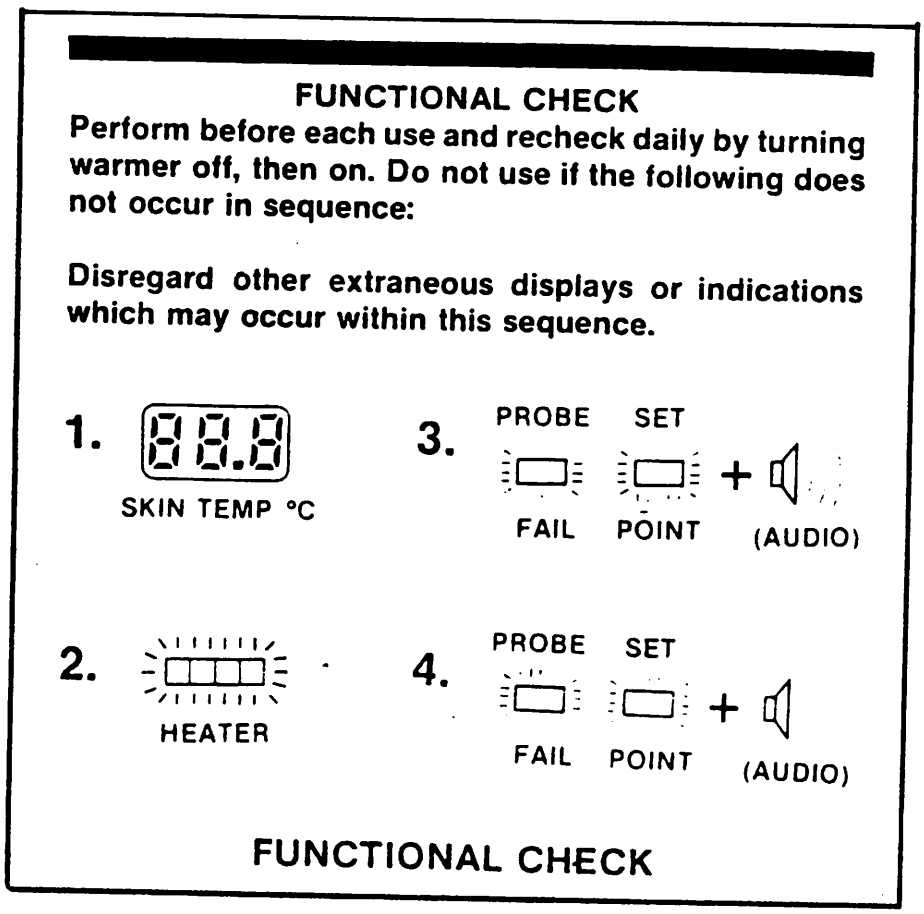
1. The SKIN TEMP °C digital display should display all eights (88.8).

2. All HEATER power indicators should light.

3. After a short delay, the displays blank, the PROBE FAIL and SET POINT alarm indicators light and the Audible Alarm sounds, then stops.

4. After a short delay, the PROBE FAIL and SET POINT Indicators light again, the audible alarm sounds, and the HEATER power indicators go out.

When the PROBE FAIL and SET POINT alarm stop, the automatic test sequence is complete.



D. DEPRESS THE CAL CHECK SWITCH; the SKIN TEMP °C display should indicate 36.0 ± 0.1°C to indicate that the unit is calibrated.

E. DISCONNECT THE POWER CORD PLUG from the wall outlet, the POWER FAIL Indicator should light, and the audible alarm should sound. Reconnect the power cord plug, the alarm should stop.

F. SET THE CONTROL MODE SWITCH TO MANUAL; the MANUAL indicator should flash on and off continuously.

G. SET THE HEAT CONTROL TO MIN and observe the HEATER power indicator; all indicator lamps should be off.

H. SLIDE THE HEAT CONTROL slowly toward MAX position; the four HEATER Indicators should be illuminated when the control is set to MAX position.

I. SET THE EXAMINATION LIGHT SWITCH on the Warmer Module to the ON-1 position; the examination lamp should light. Set the switch to the OFF-0 position; the examination light should go out.

J. DEPRESS AND HOLD THE SILENCE/RESET SWITCH. After a 15-second delay, a continuous audible alarm* should sound. Release the switch; the alarm should stop.

K. DEPRESS THE APGAR TIMER START/RESET SWITCH; the following should occur:

1. The START/RESET Indicator should light and go out after 1 minute.

2. After 1 minute has elapsed, the number "1" on the APGAR TIMER should light and the APGAR audible annunciator should "chirp."

3. The numbers "2" through "10" on the APGAR TIMER should light in sequence at 1-minute intervals and the APGAR audible annunciator should "chirp" at the 5- and 10-minute counts.

4. After 11 minutes has elapsed, the APGAR TIMER should automatically turn off.

L. THE ELECTRICAL CHECKOUT IS COMPLETE.

* Controller Model CMB78-1 Series 02 - a one second on/one second off chirping alarm should sound.

MECHANICAL CHECKOUT

A. CHECK THE SIDE AND END PANELS (Figure 2.8) of the Bassinet. Raise each panel and pivot it to hang straight down. Return the panel to the original position by reversing the procedure. Check that all panels are positively engaged to confine the infant.

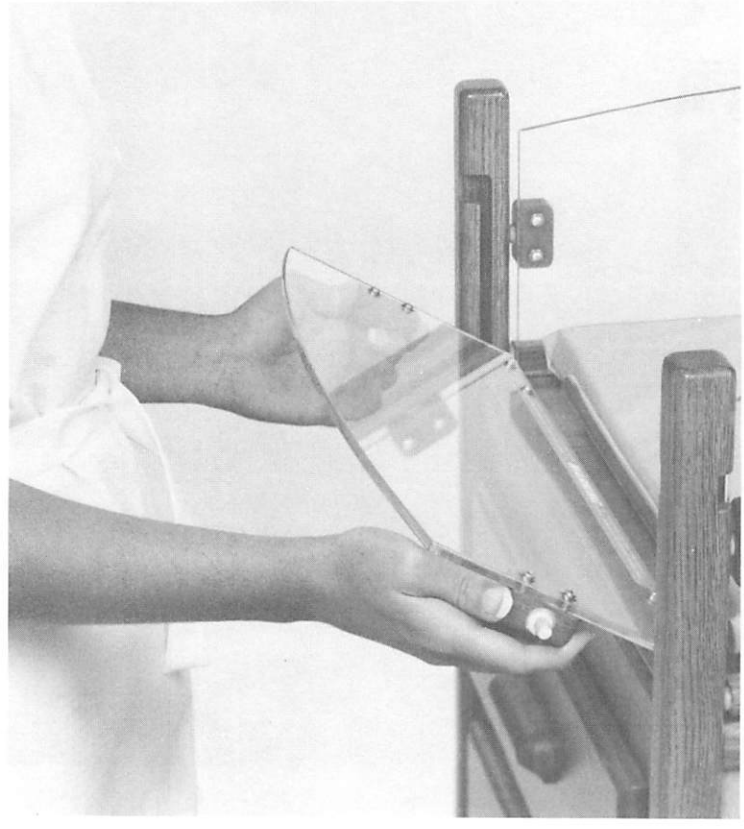


FIGURE 2.8 CHECKING SIDE AND END PANELS OF BASSINET

B. CHECK THE MATTRESS TILT (FIGURE 2.9)

1. Lower a side panel.

2. Remove the Mattress Tray and swing the bracket located on the bottom of the Tray straight down.

3. To place the Mattress Tray in the Fowler position, install the Mattress Tray such that the extended bracket fits into the wooden slot at the Head end of the Bassinet/Cart.

4. To place the Mattress Tray in the Trendelenburg position, install the Mattress Tray such that the extended bracket fits into the wooden slot at the Foot end of the Bassinet/Cart.

FIGURE 2.9 CHECKING MATTRESS TILT

SECTION 3
TECHNICAL INFORMATION

3.1 SPECIFICATIONS

Specifications for the Air-Shields® Birthing Room Warmer, System 7865 are provided in Table 3.1. All specifications are subject to change without notice.

TABLE 3.1 SPECIFICATIONS

POWER REQUIREMENTS:	
100V System	100V, 50/60 Hz, 615W
110/120V System	110/120V, 50/60 Hz, 615W
220/240 System	220/240V, 50/60 Hz, 615W
OVERLOAD PROTECTION	
100V and 110/120V System	One 13A circuit breaker
220/240V System	Two 7A circuit breakers
CHASSIS LEAKAGE CURRENT	Less than 100 µA
EXAMINATION LIGHT ILLUMINANCE	100 foot candles (nominal) at mattress center
ALARMS:	
PROBE FAIL	Actuates if Skin Probe is open, shorted, unplugged, or if the skin temperature reaches 39.0°C ±0.5°C
SET POINT	Actuates if the skin temperature deviates ± 1.0°C from the set point
POWER FAIL	Actuates when there is a loss of power
SILENCE/RESET Switch Malfunction	Actuates after 25 seconds if SILENCE/RESET switch malfunctions or is held depressed for longer than 15 seconds
POWER FAIL	Activates when there is a loss of power
SKIN TEMPERATURE SET POINT RANGE	34°C to 37.9°C

TABLE 3.1 SPECIFICATIONS (CONTINUED)

SKIN TEMPERATURE DISPLAY:

Accuracy	±0.2°C
Type	Digital LED with 0.1°C resolution
Correlation of Displayed Temperature to Skin Temperature	Typically ±0.2°C
SKIN TEMPERATURE VARIABILITY AT TEMPERATURE EQUILIBRIUM	±0.2°C
MANUAL HEAT CONTROL	Fully adjustable from zero to maximum heater power (600W nominal)
APGAR TIMER	
Battery Life (Four AA size batteries)	1000 cycles

NOMINAL DIMENSIONS AND WEIGHT -- BIRTHING ROOM WARMER

Height	77 inches (195.6 cm)
Width	28 inches (71 cm)
Depth	40.0 inches (101.6 cm)
Weight	135 lbs. (61.2 kg)

NOMINAL DIMENSIONS AND WEIGHT -- BASSINET/CART

Height	45 inches (114.3 cm)
Height (top of mattress)	38.5 inches (97.8 cm)
Length	29.0 inches (73.6 cm)
Width	22.0 inches (55.9 cm)
Weight	150 lbs. (68.2 kg)
Mattress	18 inches (61.0 cm) x 24 inches (45.7 cm)

TOTAL SYSTEM DIMENSIONS AND WEIGHT

Height	77 inches (195.6 cm)
Width	28 inches (71 cm)
Depth	48.5 inches (123 cm)
Weight	322 lbs (146 kg)

ENVIRONMENTAL

Ambient Operating Temperature	68°F (20°C) to 86°F (30°C)
Humidity	0 to 95%

ACCESSORIES

Resuscitation Module

Oxygen from wall source	50 psi nominal 100 psi maximum
Oxygen from cylinder	up to 2500 psi

3.2 THEORY OF OPERATION

This section contains a functional description of the equipment and detailed theory of operation of the Controller and Power Module in the equipment.

3.3 FUNCTIONAL DESCRIPTION

WARMER MODULE

The radiant heat from the vented hood is directed by parabolic reflectors onto the infant with minimum discomfort to attending personnel. The warmer is controlled by a single controller which provides either manual heater control or automatic skin temperature control. Located in the Warmer Module is an Examination Light which is controlled by a switch on the front of the Warmer Module. The Examination Light provides added illumination of the mattress area.

APGAR TIMER

The APGAR Timer is a battery operated, 10-minute count-up Timer which displays ten 1-minute intervals, indicated by lights. Additionally, intervals are distinguished by an audible chirp.

The Timer is turned on or off by depressing the START/STOP Switch. After 11 minutes have elapsed the unit turns off by itself.

A LOW BATTERY Indicator flashes if the unit is turned on and low battery condition exists.

BASSINET/CART

The Birthing Room Warmer Bassinet/Cart is detachable so the infant can be transported to the NICU, the general nursery or another area of the hospital.

The Bassinet has Trendelenburg and Fowler positions. In addition, the cart contains three storage drawers plus a molded drawer organizer.

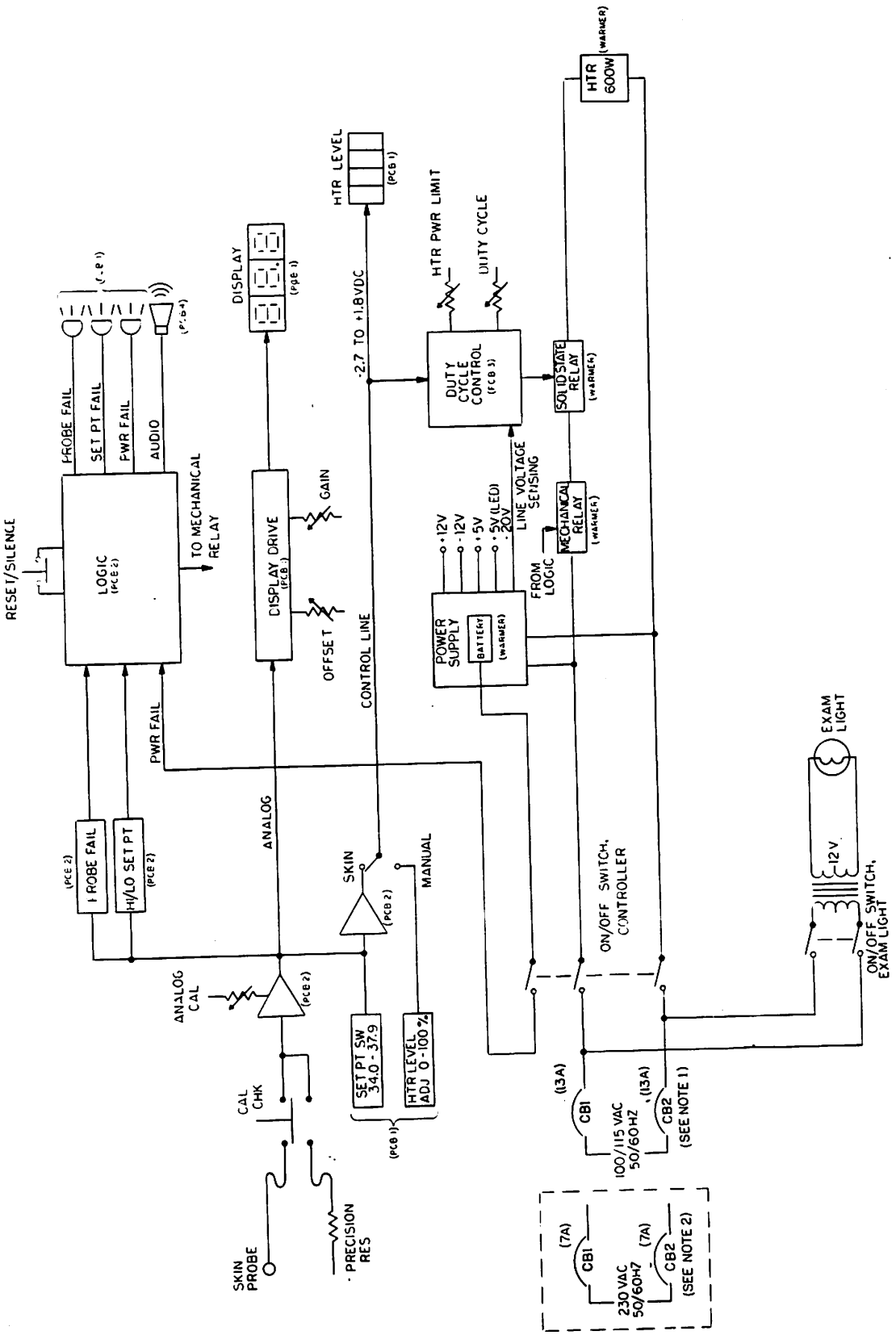


FIGURE 3.1 SYSTEM BLOCK DIAGRAM

TECHNICAL INFORMATION

CONTROLLER

When operated in the Manual Control Mode, the Controller permits the heat output of th Warmer Module to be adjusted from zero to maximum settings. When operated in Skin Temperature Control Mode, the Controller utilizes a Skin Temperature Probe connected between the Controller input and the infant to automatically adjust the heat output of th Warmer Module to maintain a desired preset skin temperature. Thumbwheel switches permit adjustment of skin temperature set point, and a digital display provides temperature readout.

ALARMS

Each time the unit is turned on, an automatic test sequence is initiated to verify that the visual displays and the audible alarm are functional. Alarms are provided for power failure, high and low skin temperature (when in Skin Temperature Control Mode); probe failure and unplugged probe, SILENCE/RESET switch malfunction, and manual alert when in Manual Control.

POWER FAIL. If power to the unit is interrupted for any reason, the POWER FAIL indicator will light and the audible alarm will sound continuously.* When power is restored, the alarm circuit is self-resetting.

SET POINT (HIGH). If the temperature sensed by the skin prone is 1.0°C above the set point temperature, a high set point alarm will occur after a 15-second delay. The SET POINT indicator will flash, a continuous audible alarm* will sound and the heater is turned off.

The audible portion of the alarm can be silenced by depressing the SILENCE/RESET Switch; however, the indicator will continue to flash. If the condition is not corrected within 15 minutes, the audible alarm will resume. When the alarm condition is corrected, the circuit will automatically reset.

NOTE: If not manually reset when the sensed temperature returns to set point and the temperature falls to 1.0°C below set point, the system changes to a low set point alarm condition. The alarm indications and the heater turn on again. The alarm indications will cease if the sensed temperature returns to set point (see SET POINT (LOW) which follows).

NOTE: The SILENCE/RESET switch must be depressed for at least 2 seconds after the audible signal is silenced to allow internal circuitry to reset. Failure to do so could result in alarm reactivation.

* Controller Model CMB78-1 Series -02 - a one second on/one second off chirping alarm will sound.

SET POINT (LOW): If the temperature sensed by the skin probe is 1.0°C below the set point temperature, a low set point alarm will occur after a 15-second delay. The SET POINT indicator will flash, and a continuous audible alarm* will sound. The audible portion of the alarm can be silenced by depressing the SILENCE/RESET switch; however, the indicator will continue to flash. If the condition is not corrected within 15 minutes, the audible alarm will resume. When the alarm condition is corrected, the circuit will automatically reset.

If the infant's skin temperature is more than 1.0°C below the SET TEMP, the visual SET POINT alarm will flash but the audible alarm is automatically silenced for the first 15 minutes of warm-up or until the skin temperature is within 1.0°C of SET POINT, whichever is shorter. After the initial 15-minute period, the low SET TEMP alarm returns to normal function.

NOTE: The SILENCE/RESET switch must be depressed for at least 2 seconds after the audible signal is silenced to allow internal circuitry to reset. Failure to do could result in alarm reactivation.

PROBE FAIL. If the skin temperature probe is open, sorted or unplugged, a probe alarm will occur after a 15-second delay. The display will blank, the PROBE FAIL alarm indicator will flash, a continuous audible alarm* will sound, and the heater will be turned off. This alarm cannot be reset until the alarm condition is corrected. The PROBE FAIL alarm will also sound if the skin temperature reaches 39.0°C.

SILENCE/RESET SWITCH MALFUNCTION. If the SILENCE/RESET switch malfunctions, a continuous audible alarm* will sound after a 15-second delay. The alarm will also sound if the switch is held depressed for more than 15 seconds. This alarm cannot be reset until the alarm condition is corrected.

MANUAL. After 10 minutes of operation, an intermittent beep** (Manual Alert) will sound every 30 seconds. During the next 5-minute period, the heater may be reset for an additional 15 minutes without the heater turning off by pressing the SILENCE/RESET switch. If the circuit is not reset, the heater is automatically turned off when 15 minutes of continuous operation have elapsed, the MANUAL indicator lights steady, and a steady audible alarm* is activated.

NOTE: The SILENCE/RESET switch must be held depressed for at least 2 seconds after the audible signal is silenced to allow internal circuitry to reset. Failure to do so could result in alarm reactivation.

* Controller Model CMB78-1 Series -02 - a one second on/once second off chirping alarm will sound.

** Controller Model CMB78-1 Series 02 - a one second chirp will sound.

POWER MODULE

The Power Module plugs into the Warmer Module. A detachable power cord supplies line voltage to the Power Module and overload protection is provided by circuit breaker(s). The Power Module supplies power to the Controller by means of a plug-in ribbon cable located in the warmer housing.

The Power Module also provides power to the examination light, and warmer heating element in the warmer housing.

3.4 DETAILED CIRCUIT DESCRIPTION

The following paragraphs contain detailed circuit descriptions of the following components of the equipment.

- Warmer Module
- Power Module
- Controller

3.4.1 WARMER MODULE

Refer to Figures 7.6 and 7.7. The Warmer Module contains a 600 watt quartz heater (HTR1) that provides radiant heat for infant warming. The heater is contained in a vented hood and the radiant heat is directed onto the mattress by a parabolic reflector. The Warmer Module also contains the examination light and connectors for the optional Phototherapy Attachment.

Power for the Warmer Module is supplied by the Power Module (paragraph 3.4.2) which plugs into the warmer housing. The interconnection is made through connector J2. The WARMER ON-OFF switch (S1) controls application of AC power to the Power Module which supplies DC power to the Controller (paragraph 3.4.3). The Controller, in turn, controls heater power. The EXAMINATION LIGHT ON-OFF switch (S3) and transformer T2 supply power to the examination light (DS1).

3.4.2 POWER MODULE

Refer to Figures 7.1 and 7.1A. The Power Module plugs into the Warmer Module through connector J2 and supplies all AC and DC power to the equipment. Primary AC power is applied through a detachable power cord to AC input connector J1. Circuit breaker(s) provide overload protection for the AC line.

When the WARMER ON-OFF Switch (S1) on the Warmer Module is set to the ON-1 position, power is applied to the primary winding of power transformer T1 through connectors J2, J5 and J6. Transformer T1 has two secondary windings, one feeds bridge rectifier CR3 and the other feeds rectifiers CR5 and CR6. The positive (+) output of CR3 feeds voltage regulators VR1 and VR2 which in turn, produce regulated outputs of +12.6 VDC and +5 VDC, respectively. These outputs are fed to J10-5 and -6 and J10-17 and -18. CR3 also produces an unregulated +20 VDC output at J10-9. The negative (-) output of CR3 produces an

unregulated -20 VDC output at J10-10 and, in conjunction with voltage regulator VR3, a regulated -12 VDC output at J10-15 and -16. Filtering for these circuits is provided by capacitors C1 through C5. Rectifiers CR5 and CR6 produce and unregulated +5 VDC output at J10-3 and -4. Filtering for this circuit is provided by capacitor C6. Solid State Relay (SSR) K2 controls heater power during operation. The relay is actuated by the signals SSR HI (J10-7) and SSR LO (J10-8) which are generated on the CONTROL/APGAR TIMER Board PCB3.

Relay driver Q1 and relay K1 are activated by the signal RELAY DRIVE (J10-20). The control signal is generated on PCB2. The circuit provides a redundant means of cutting off power in the event of an alarm.

Battery BT1, and associated components provide the voltage necessary to activate the POWER FAIL alarm in the event of primary power failure.

3.4.3 CONTROLLER

DISPLAY BOARD - PCB1

The Display Board, PCB1, contains the digital readout for skin temperature, alarm indicators, heater output indicators, control mode indicator and switches for calibration, reset and control mode. Refer to Figure 7.1.

TEMPERATURE DISPLAY

The analog signal inputs from the Measurement/Digital Board, PCB2, are converted to the digital signals needed to drive the seven segment LED displays, DS1 through DS3, by the A/D Converter U1. The A/D converter includes auto zero and current limiting for the LED drivers. The number of readings per second is determined by the RC network R6 and C4 which gives approximately one reading per second. C3 is a bypass capacitor and is used to reduce noise in the voltage reference circuit. The RC network (R5, C1 and C2) is used to provide proper operation of the auto zero and integrator circuits in the A/D converter.

The sensitivity of the A/D converter is determined by the voltage reference at Pin 36. Resistor network R11 and R12 sets the voltage reference at a nominal 2.0 volts which will provide a sensitivity of 200 mV per °C. Trimpots R2 and R7 set the converters offset and gain respectively.

The diode network CR1, CR2 and CR3 is used to provide display blanking when the input voltage is outside the permissible limits caused by the temperature measuring thermistor being either open or shorted.

The lamp test function is provided by U4 which drives Pin 37 of the A/D converter high, lighting all the display segments and giving a reading of 88.8. Note that the decimal point is driven through R1 at all times, so the decimal point is lighted, even when the input range is exceeded, blanking the display.

The A/D converter uses the system +5 V supply and a -5 V supply derived from a unity gain inverting op amp which ensures power supply tracking. The LED supply is obtained from a separate high current +5 V supply.

CONTROLS

The CAL CHECK switch, S2, is a momentary pushbutton switch that is used to check the temperature measuring circuit calibration. Depressing this switch inserts a precision resistor, R17, in place of the skin probe and will cause the temperature display to read 36.0 ± 0.1°C if the circuit is calibrated.

The SILENCE/RESET switch, S3, is used to reset various circuits in the Controller as follows:

1. IN SKIN TEMPERATURE CONTROL MODE, it performs the following:

   a. Silences high or low SET POINT alarm for nominally 15 minutes; alarm silence is automatically over-ridden if another alarm occurs within the period of silence.

   b. Resets PROBE FAIL alarm only after the condition is corrected.

2. IN THE MANUAL CONTROL MODE, it performs the following:

   a. Resets the manual control timer after 10 minutes of expired time.

   b. Resets manual control timer, silences alarm, and restores heater power after 15 minutes of expired manual control.

   The CONTROL MODE switch, S1, is a three section switch which controls the following:

   a. SWITCH SECTION S1-A controls the selection of the SKIN control mode indicator, DS4, or MANUAL control mode indicator, DS5.

   b. SWITCH SECTION S1-B controls the selection of either the manual or skin control circuitry on the Measurement/Digital Board PCB2 (refer to Figure 7.2).

   c. SWITCH SECTION S1-C serves as a manual switching point for logic levels used by various control circuits on the Measurement/Digital Board PCB2 (refer to Figure 7.2).

The MIN-HEAT-MAX control, R35, provides the means for adjusting heater output in the manual mode of operation. The control permits adjustment of heater power from zero to maximum.

The SKIN TEMP °C thumbwheel switches, S4, are used to select set point temperature during skin mode of operation. The binary coded decimal switches interconnect with binary weighted resistors on the Measurement/Digital Board PCB2 (refer to Figure 7.2) to control the set point temperature. The switches have mechanical stops to limit the setting of the set point to between 34.0°C and 37.9°C.

INDICATORS

The SKIN control Mode indicator, DS4, lights when operating in skin temperature control mode. The MANUAL Control Mode indicator, DS5, flashes continuously when operating in manual control mode. The MANUAL Control Mode indicator may be switched off by a signal from PCB2.

The HEATER level indicator, DS6, is a four segment LED that provides a relative indication of heater output. The indicator segments are driven by a quad comparator, U3, so that the heater output is indicated in discrete steps. The number of lamps illuminated indicates the relative heater output.

The SET POINT alarm indicator, DS8 and U2, flashes and a continuous audible alarm occurs when the skin temperature deviates ± 1.0°C from the set point temperature for longer than 15 seconds. If the temperature returns to within 1.0°C of set point, the alarms are reset automatically.

If not manually reset when sensed temperature returns to set point, and temperature falls to 1°C below set point, alarm system changes to a low set point alarm condition and heater turns on again. Alarm indications will now cease if sensed temperature returns to set point.

The PROBE FAIL alarm indicator, DS7 and U2, flashes and a continuous audible alarm sounds to indicate an open probe, shorted probe, unplugged probe, or skin temperature above 39.0 ± 0.5°C. After a 15-second delay, the heater is shut down. After the condition is corrected, the RESET button must be depressed to turn off the indicator, silence the alarm, and restore heater power.

The POWER FAIL alarm indicator, DS9 and Q2, lights continuously and an audible alarm occurs when there is a loss of power. The circuit is powered by a battery, BT1, in the Power Module. The alarm is self-resetting with the resumption of power.

MEASUREMENT/DIGITAL BOARD - PCB2

ANALOG SECTION

The analog section of PCB2 consists of six separate circuits. Refer to Figure 7.2.

The first circuit is the patient probe thermistor amplifier, U1, (pins 1, 2 and 3). This is a nonlinear inverting circuit which combines the temperature versus resistance characteristic of the patient probe thermistor (T1) with a fixed reference voltage to produce an almost perfectly linear voltage versus temperature output. The output voltage is fed to J2-14 and rises nominally 200mV/°C from 0 volts at 20.0°C to 4.0 volts at 40.0°C.

The output of the thermistor amplifier is fed to the probe fail limit comparators, U3 (pins 10, 11 and 13) and U3 (pins 8, 9 and 14). These comparators form a window comparator whose output is high as long as the output of the thermistor amplifier is less than 3.8 volts and greater than -5.0 volts. If the output of this circuit goes low, due to an open probe, shorted probe, unplugged probe, or a probe temperature above 39.0°C, a PROBE FAIL signal is generated at J2-6.

The set point D to A converter U1, (pins 5, 6 and 7) senses the setting of the thumbwheel switch assembly S4 on PCB1 (refer to Figures 7.1 and 7.2). Switch S4 has a network of binary weighted resistors connected to +5.0 Vdc, and as the number dialed into the thumbwheels is increased, more resistors are connected in parallel with +5 Vdc to J2-1. Therefore, increasing the set point causes a voltage that increases in a negative direction at U1-7.

The set point voltage and the voltage representing temperature are combined in the deviation amplifier, U2 (pins 5, 6 and 7). This amplifier sums the voltages and produces an output proportional to set point minus temperature. With the set point fixed, as temperature decreases, the difference voltage at J2-7 increases.

This voltage also feeds a set of limit comparators, U3 (pins 1, 6 and 7) and U3 (pins 2, 4 and 5). This circuit produces a low output at J2-20 if the measured temperature is 1°C below set point, or a low output at J2-24 if the measured temperature is 1°C above set point.

The last analog section is a buffer, U2 (pins 1, 2 and 3) and associated components. The input is taken from the manual heater control on the display board PCB1, and the output is fed back to the control board PCB3 where a slide switch selects skin or manual control.

DIGITAL SECTION

The digital logic section is run synchronously by master clocks 01 (1 Hz) and 02 (1/2 Hz). These signals are generated by U6A and U8A, respectively. Since these clocks are vital to the functioning of the unit, a "dead man" timer formed by U20 (pins 8 through 12) detects the absence of a clock signal and activates the audio alarm trigger U6B if the clock signal is not present.

If the silence/reset circuit malfunctions, a continuous audible alarm will sound after a 15-second delay. The alarm will also sound if the SILENCE/RESET switch is held depressed for more than 15 seconds. The signal that triggers the alarm is generated by U9B which is configured as a 15-second timer.

Most of the digital circuitry is involved in the start up test sequence. When power is applied, the start up sequence is coordinated by U15, a one of eight decoder. The start up proceeds as follows:

1. THE DISPLAY TEST pin (J2-8) goes high, turning on all the segments in the temperature display.

2. ANALOG SWITCH U4 is used to simulate an open probe, turning on the probe fail (J2-6 and 27), set point fail (J2-28), low temp. alarm (J2-20), heater power display, and audio (J2-29) alarms; this condition is reset.

3. ANALOG SWITCH U4 is then used to simulate a shorted probe. This turns on the high temp. (J2-24), probe fail (J2-6 and 27), set point (J2-28), and audio (J2-29) alarms; this alarm is also reset.

4. THE POWER UP SEQUENCE GENERATOR (U15) then latches itself in the last state, and the unit will function normally.

In the normal (non-start up) mode, any alarm condition (except clock fail) must exist for about 15 seconds before alarms will be activated. This function is performed by U9A and associated components.

When a high or low temp. alarm is sounded, depressing the SILENCE/RESET switch will silence the alarm from sounding for 15 minutes by activating counter U10.

In addition to the solid state relay which controls the heater power in operation, a safety interlock mechanical relay is powered by U18 (pin 4). This relay provides a redundant means of cutting off power in the event of an alarm. This circuit also ensures that the heater power lights are off in this instance (U4, pins 1 and 2).

The logic used to turn the set point and probe fail indicators on comprises U7A and B and associated components; the lights are caused to flash by clock signal 02 (J2-26).

Finally, the circuit formed by U6B, U12-U14, U16-U18 is used during the manual mode. When first switched into the manual mode, the manual lamp flashes. After nominally 10 minutes, J2-29 is pulsed high for 1 second by U6-B every 30 seconds, causing a short beep. After 5 additional minutes, the manual light and the audible alarm are activated continuously and heater power is disconnected by U18.

CONTROL BOARD - PCB3

CONTROL VOLTAGE LIMITER

The function of the voltage limiter is to limit maximum heater output power to approximately 560 watts. As line voltage rises, the power available from the heater goes up by the square of the voltage. The limiter prevents the power from going over the 651 watt limit. Refer to Figure 7.3.

A portion of the unregulated +2 Vdc is fed to buffer U1 (pins 5, 6 and 7). The output of the buffer is fed to the minus (1) input of summing amplifier U1 (pins 1, 2 and 3). The voltage at the plus (+) input (U1-3) is a precision voltage set by the Duty Cycle Limit Adjust control, R6, during calibration. The output of the summing amplifier (U1-1) is fed to a clamp circuit (U1 pins 9, 10, 11 and CR1) which prevents the voltage on J3-12 from rising above the voltage on U1-10. As long as the voltage at J3-12 is less than the voltage at U1-10, the clamp circuit has no effect on operation and the voltage on TP2 (J3-26) equals the voltage on J3-12. At this point, -2.7 volts equals 0% duty cycle and +1.8 volts equals 100% during cycle.

CONTROL AMPLIFIER

The signal CONT.-INPUT on J3-12 represents a weighted error signal (set point temperature). This error signal is applied to a control amplifier, U1 (pins 12, 13 and 14).

The error signal at the output of the control amplifier (U1-14) is applied to the minus (-) input of a proportional amplifier (U2-9). At this point, the error signal is inverted and summed with an adjustable offset voltage established at U2-10 by the setting of the Duty Cycle Adjust control R14 which sets the zero reference of the duty cycle controller. The error signal is also AC coupled to an amplifier U2 (pins 12, 13 and 14) which produces a signal proportional to the rate of change of the error signal.

The output signals at U2-14 and U2-8 are summed together by R11/R17 and amplified by U2 (pins 5, 6 and 7). At TP3 (J3-26) approximately 0.2 volts equals 0% duty cycle and approximately -1.6 volts equals 100% duty cycle.

DUTY CYCLE CONTROLLER

The duty cycle controller is formed U2 (pins 1, 2 and 3) and associated components. As the voltage on U2, pin 7 decreases, the duty cycle at U2, pin 1 increases. The output of the controller is fed to Q1 which drives the solid state relay (SSR) K2 in the power module.

MOTHERBOARD - PCB4 Controller Model CMB78-1 Series 00 and 01

Refer to Figure 7.4. The mother board provides the means for power and signal distribution to PCB1 (J1), PCB2 (J2), PCB3 (J3), set point switch (J7), and skin probe (J5). A ribbon cable connected to J4 provides the interconnections between the controller and power module.

A thumbwheel switch assembly is connected to J7. Resistors R1 through R8 are used in conjunction with the set point switch assembly to develop the proper resistance value necessary for PCB2 circuitry.

During normal operation, the audible alarm (DS1) is not driven by the free running oscillator (U1) due to clamping action of peripheral driver (U2). During alarm conditions, U2 allows U1 and its associated discrete components to drive the Pizzo electric transducer (DS1). Under power failure conditions, the clamping action of U2 is inoperative and transducer circuitry is powered by a battery. In Series 01 Models J9 is provided for attachment of the remote alarm module accessory. P9, jumper plug, or the remote alarm module must be connected or alarm will occur.

MOTHERBOARD - PCB4 Controller Model CMB78-1 Series 02

Refer to Figure 7.9. The motherboard provides the means for power ans signal distribution to PCB1 (J1), PCB2 (J2), PCB3 (J3), setpoint switch (J7), and skin probe (J5). A ribbon cable connected to J4 provides the interconnections between the controller and power module.

A thumbwheel switch assembly is connected to J7. Resistors R1 through R8 are used in conjunction with the setpoint switch assembly to develop the proper resistance value necessary for PCB2 circuitry.

During normal operation, the audible alarm speaker (DS1) is not driven by the audio drive circuit due to the clamping action of theperipheral driver, U2B. During alarm conditions, U2B allows the alarm drive circuit (U1, U3A, U4) to drive the speaker (DS1). U4A, B, C and associated R9, 10, C1 form a free running oscillator. U1, U4D and U3A modulate the fundamental frequency to provide a chirping sound with an approximately 1 second ON/OFF period. Volume control R11 will vary voltage applied to speaker DS1.

J9 is provided for attachment of the remote alarm module accessory. P9, jumper plug, or the remote alarm module must be connected or alarm will occur.

3.4.4 APGAR TIMER (Refer to Figure 7.5)

When START/STOP switch is depressed, it applies the battery voltage (+6.0V) via CR1 to the SET 1 input of U1. U1, an under/over voltage detector, has two functions. The first function is to supply voltage to U2, U3, U4, U5 and U6. This is accomplished in the following manner, when the START/STOP switch is depressed it applies 6.0 volts to the SET 1 input, which in turn, turns on the HYS1 output (pin 2) which applies battery voltage from pin 8 to the rest of the circuitry. In addition, the voltage from the START/STOP switch is applied to the T input of U2 which, drives the Q output (pin 5) high. This high is applied to the SET 1 input and ensures that the HYS1 output will be turnued on. When the START/STOP switch is depressed again, the Q output of U2 goes low, which in turn turns off the HYS1 output of U2 and the rest of the circuit.

The second function of U2 is to detect low battery voltage. When the voltage at the junction of voltage divider R1 and R2 falls below 1.3 volts, the SET 2 (pin 6) input of U2 turns on the OUT 2 (pin 7) output, which in turn, turns on LO BAT LED 12 via the $\overline{Q}$ (pin 8) output of U2. U3, a 7213, provides the clocks for the circuitry. The 1 MIN (pin 14) output is applied to U5 and U6 which drives LED 1 through LED 10 the 1 minute to 10 minute indicators.

The START/STOP LED 11 is on for the first minute of operation and then turns off. It is turned on in the following manner. When the unit is turned on, U4 is cleared (pin 1 CL) and then preset by the RC time of R9 and C3. When the first positive transistion occurs at pin 3, it is turned off because Q (pin 5) goes high. It will remain in this state because the preset and clear are held high and all other clock pulses will be ignored.

Audible chirps are sounded at the 1 minute, 5 minute and 10 minute intervals. This is accomplished when the signal via CR6, CR7 or CR8 is applied to PR input (pin 10) of U4. This activates AL1 via the $\overline{Q}$ (pin 8) of U4.

When the 11 minute mark is reached, the A2 output (pin 3) of U6 and acts upon U1 and U2 in the manner as the START/STOP switch which is described above.

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SECTION 4
PREVENTIVE MAINTENANCE

4.1 GENERAL

This section provides preventive maintenance procedures for the Air-Shields® Birthing Room Warmer, System 7865. Included are cleaning instructions, sterilization procedures and a calibration schedule.

WARNING:

- If oxygen is in use, make sure that the oxygen supply to the equipment is turned off and that it is disconnected from the oxygen supply when performing cleaning and maintenance procedures; a fire and explosion hazard exists when performing cleaning and/or maintenance procedures in an oxygen enriched environment.
- An electrical shock hazard exists when performing cleaning and maintenance procedures; make sure that the power cord is disconnected from the wall receptacle.

4.2 CLEANING

When an infant is removed from the Bassinet/Cart, or at least once a week, the equipment should be thoroughly cleaned and disinfected. Cleaning can most effectively be accomplished by disassembling, then grouping the parts and/or assemblies in categories according to the method of cleaning required.

4.3 DISASSEMBLY FOR CLEANING

NOTE: Refer to Sections 4.4 and 4.5 for Cleaning and Sterilization procedures for this equipment.

4.3.1 DISASSEMBLY OF BASSINET

A. DISENGAGE AND PULL AWAY THE BASSINET/CART from the Birthing Room Warmer. Lock the Bassinet/Cart wheels.

B. REMOVE THE PANELS by grasping the wooden handles and pulling them straight up and swinging them away from the corner posts (Figure 5.1).

C. REMOVE THE MATTRESS AND MATTRESS TRAY.

D. REMOVE SIDE AND END PANELS (Figure 5.1).

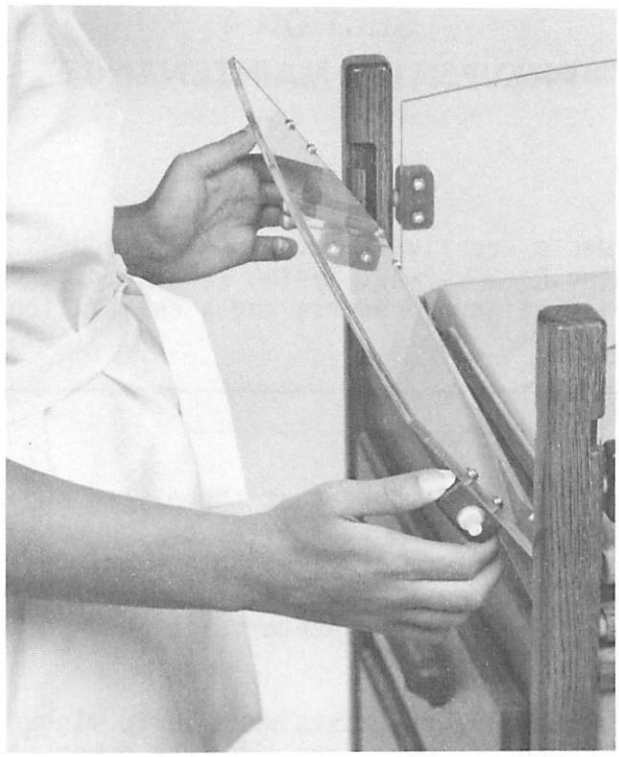


FIGURE 4.1 REMOVING SIDE AND END PANELS

E. REMOVE THE DRAWERS by pulling them all the way out, then simultaneously pressing down on the right and raising up on the left catch located in the door track.

4.3.2 REMOVAL OF MONITOR SHELVES (ACCESSORY)

A. REMOVE ANY MONITOR SHELF, from the Post by lifting up on the shelf to remove the swivel pin from the bearing mount on the Post. (Swivel lock knob must be loose.)

B. REPLACE ANY MONITOR SHELF, by reversing the above procedure.

4.4 CLEANING PROCEDURES

When an infant is removed from the Bassinet/Cart, or at least once a week, the equipment should be thoroughly cleaned and disinfected.

4.4.1 CLEANING AGENTS

An iodophor or quaternary disinfectant-detergent registered by the U.S. Environmental Protection Agency should be used, but only when the equipment is not in use. A cleanser such as Air-Shields Kleenaseptic® Germicidal Surface Cleanser may be used. When using any cleaning agent, follow the manufacturer's directions for use. Before cleaning, remove all solid wastes and contaminants from the disassembled parts.

4.4.2 PAINTED SURFACES

Use a disinfectant-detergent to clean all surfaces thoroughly, then dry with a clean cloth or paper towel.

4.4.3 CLEAR PLASTIC AND ACRYLIC SURFACES

CAUTION:

- Alcohol can cause crazing of plastic and acrylic. Do not use alcohol, acetone or any organic solvents for cleaning.
- Do not expose plastic and acrylic to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking and crazing of clear plastic and acrylic.

Use a disinfectant-detergent to clean all surfaces thoroughly. Make sure to clean all holes, indentations, baffles, etc., then dry with a clean cloth or paper towel.

4.4.4 METAL SURFACES

Use a disinfectant-detergent to thoroughly clean all surfaces, then dry with a clean cloth or paper towel.

IMPORTANT: After cleaning, a complete operational checkout (paragraph 4.3.1) should be performed before returning the unit to service.

4.4.5 WOODEN SURFACES

Use a disinfectant-detergent to thoroughly clean all surfaces, then dry with a clean cloth or paper towel.

4.4.6 PATIENT PROBE AND MATTRESS

CAUTION: Do not pull on the tip of the skin probe when cleaning or drying; damage to the patient probe may result.

Use a disinfectant-detergent to thoroughly clean all surfaces, then dry with a clean soft cloth or paper towel.

NOTE: The mattress should only be sterilized with a surface disinfectant.

4.5 STERILIZATION

CAUTION: DO NOT STEAM AUTOCLAVE. Gas sterilization temperature should not exceed 54.4°C (130°F).

Sterilization can be accomplished with the following agents:

1. COLD STERILIZATION

   CAUTION: Do not expose plastic and acrylic to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking of gasket surfaces, fading of paint, and ultimately, crazing of plastic and acrylic.

2. GAS STERILIZATION (ETHYLENE OXIDE) Prior to gas sterilization, the entire unit should be thoroughly cleaned as described elsewhere in this section. Remove and discard all used disposable elements. New disposable elements should be installed after sterilization.

   Standard gas sterilization procedures as programmed by automatic equipment such as made by American Sterilizers and Wilmot Castle are satisfactory as these do not normally exceed 54.4°C (130°F).

   IMPORTANT: After sterilization, a complete operational checkout procedure should be performed before returning the unit to service.

4.6 CALIBRATION SCHEDULE

It is recommended that the Controller and Power Module be tested and calibrated at least every 4 to 6 months and after repairs have been made. Calibration and test procedures are provided in Section 5 of this manual.

SECTION 5
SERVICE

5.1 GENERAL

This section provides calibration, troubleshooting, and removal and replacement instructions for the Air-Shields® Birthing Room Warmer, System 7865.

5.2 TEST AND CALIBRATION PROCEDURES

5.2.1 GENERAL

This paragraph provides calibration and test procedures for the Air-Shields® Birthing Room Warmer, System 7865. Unless otherwise indicated, all test and calibration procedures are performed under the following conditions:

1. THE EQUIPMENT IS CONNECTED TO A PRIMARY POWER SOURCE of the correct voltage and frequency. (Refer to data tags.)

2. AMBIENT TEMPERATURE FOR TEST and calibration is 24.0°C ± 3.0°C (75.0°F ± 5.0°F).

5.2.2 TEST EQUIPMENT REQUIRED

The following test equipment is required for test and/or calibration. Equivalent test equipment may be substituted.

- Variac - General Radio Model W5MT3A (100V and 110/120V models)
- Variac - General Radio Model W20HMT3A (220/240V models)
- Digital Voltmeter - Fluke 8000A
- Extender Board - Air-Shields Vickers Part No. 78 319 70
- Oscilloscope - Tektronix 561A
- Extension Ribbon Cable - Air-Shields Vickers Part No. 78 319 20
- Probe Simulator - Air-Shields Vickers Part No. 68 900 80
- Sound Level Meter - 45-75 dBA Range

NOTE: Probe Simulator Part No. 68 900 80 is also used for test and calibration of the Model C100 Infant Incubator.

5.2.3 POWER MODULE CALIBRATION PROCEDURE

TEST HOOKUP

1. REMOVE THE POWER MODULE from the Warmer Housing (refer to paragraph 5.4.3 and Figure 5.3).

2. REFER TO FIGURE 7.1A and connect jumper wires to the Power Module as follows.

   J2-9 to J2-21
   J2-7 to J2-19
   J2-11 to J2-23
   This replaces the connections normally supplied by the WARMER switch.

3. CONNECT LINE VOLTAGE TO THE POWER MODULE using a Variac, Adjust the input voltage as follows:

   110/120V Power Module; 115 VAC ± 1.0 VAC
   220/240V Power Module; 230 VAC ± 1.0 VAC
   100V Power Module; 100 VAC ± 1.0 VAC

PROCEDURE

1. CONNECT A DIGITAL VOLTMETER between TP1 and TP4 (ground) and adjust R6 for a reading of +12.6V ± 50mV.

2. CONNECT A DIGITAL VOLTMETER between TP2 and TP4 (ground) and adjust R9 for a reading of +5.0V ± 50mV.

3. CONNECT A DIGITAL VOLTMETER between TP3 and TP4 (ground) and adjust R12 for a reading of -12.0V ± 50mV.

4. REINSTALL THE POWER MODULE in the Warmer Housing.

5.2.4 CONTROLLER CALIBRATION PROCEDURE

IMPORTANT:

- When calibrating the Controller, all adjustment procedures must be performed in the order given to obtain correct results.

- If any procedure cannot be completed, refer to the appropriate troubleshooting information given in paragraph 5.3.

TEST HOOKUP

1. REMOVE THE CONTROLLER from the Mounting Post (refer to paragraph 5.4.3).

2. REMOVE PCB3 from the Controller and reinstall using Extender Board, Part No. 78 319 70 to provide access to test points and adjustments.

3. USING EXTENSION RIBBON CABLE, part no 78 319 20, reconnect the Controller to the interconnecting ribbon cable (item 2, Figure 5.2).

4. CONNECT THE PROBE SIMULATOR part no. 68 900 80 to the PATIENT PROBE jack on the Controller.

5. CONNECT LINE VOLTAGE to the Power Module using a Variac. Adjust the line voltage as follows:

   110/120V Power Module; 115 VAC ± 1.0 VAC
   220/240V Power Module; 230 VAC ± 1.0 VAC
   100V Power Module; 100 VAC ± 1.0 VAC

6. SET THE WARMER SWITCH on the Warmer Housing to the ON-1 position.

ANALOG CALIBRATION

1. CONTROL VOLTAGE ADJUSTMENT

   A. Set the CONTROL MODE switch on the Controller to SKIN position, the SKIN indicator should light.

   B. Set the SKIN TEMP.°C thumbwheel switches on the Controller to 36.0°C.

   C. Set the control switch on the Probe Simulator to SKIN and the °C switch to 36.0°C.

   D. Connect a digital voltmeter to J3-12 on PCB3 (Figure 5.2); the ground connection is J-3,4.

   E. Adjust potentiometer R2 on PCB2 (Figure 5.2) until the digital voltmeter reads 0.0 ± 0.05 VDC.

DISPLAY CALIBRATION

1. OFFSET ADJUSTMENT

A. Set the CONTROL MODE switch on the Controller to MANUAL position, the MANUAL indicator should flash continuously.

B. Set the °C switch on the Probe Simulator to 25.0°C.

C. Adjust potentiometer R2 on PCB1 (Figure 5.2) until the digital display indicates 25.0°C.

2. GAIN ADJUSTMENT

A. Set the °C switch on the Probe Simulator to 36.0°C.

B. Adjust potentiometer R7 on PCB1 (Figure 5.2) until the digital display indicates 36.0°C.

NOTE: It may be necessary to repeat the Offset and Gain Adjustments to obtain accurate results.

CONTROL CIRCUIT CALIBRATION

1. LINE VOLTAGE ADJUSTMENT

A. Set the CONTROL MODE switch on the Controller to SKIN position, the SKIN indicator should light.

B. Set the SKIN TEMP. °C thumbwheel switches on the Controller to 36.4°C.

C. Set the °C switch on the Probe Simulator to 36.0°C.

D. Connect a digital voltmeter to J3-14 on PCB3 (Figure 5.2); the ground connection is J3-3,4.

E. Adjust line voltage until digital voltmeter indicates 23.3 ± 0.02 VDC.

F. Connect a digital voltmeter to J3-25 on PCB3 (Figure 5.2); the ground connection is J3-3,4.

G. Adjust potentiometer R6 on PCB3 until the digital voltmeter indicates +1.80 ± 0.05 VDC with full heater power.

H. Readjust the line voltage as follows:

110/120V Models; 115 ± 1.0 VAC
220/240V Models; 230 ± 1.0 VAC
100V Models; 100 ± 1.0 VAC

2. DUTY CYCLE ADJUSTMENT

A. Set the SKIN TEMP °C thumbwheel switches on the Controller to 36.0°C.

B. Connect an oscilloscope to J3-11 on PCB3 and adjust potentiometer R14 on PCB3 (Figure 5.3) for a duty cycle of 60% as shown below.

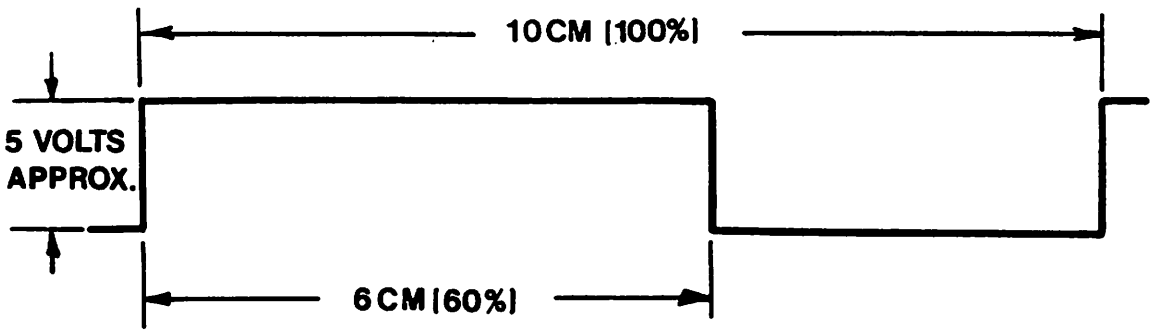


FIGURE 5.1 DUTY CYCLE ADJUSTMENT

2. ALARM SOUND LEVEL ADJUSTMENT

The alarm sound level is factory set for a level of 65 dBA minimum. To lower the sound level proceed as follows:

Equipment Required: Sound Level Meter 45-75 dBA Range.

A. Locate the Sound Level Meter 3 meters (11 ft, 9 in) from the front of the Controller and 1.8 meters (7 ft, 1 in) from floor level.

B. Adjust R11 on PCB4 for the desired sound level.

5.2.5 PERFORMANCE CHECKS — SKIN CONTROL MODE

TEST CONDITIONS

1. SET THE WARMER SWITCH on the Warmer Housing to the OFF-O position.

2. REMOVE THE EXTENDER BOARD from the Controller and disconnect the extension ribbon cable.

3. REINSTALL PCB3 in the Controller, reconnect the Controller to the Power Module, and reinstall the Controller in the Mounting Post (Figure 5.2).

4. SET THE CONTROL MODE SWITCH on the Controller to SKIN position.

5. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C.

6. CONNECT THE PROBE SIMULATOR, Part No. 68 900 80 to the PATIENT PROBE jack on the Controller; set the control switch to SKIN and the °C switch to 36.0°C.

START-UP SEQUENCE

1. SET THE WARMER SWITCH ON THE WARMER HOUSING to the ON-1 position.

   NOTE: During the automatic test sequence, disregard other extraneous displays or indications which may occur within this sequence.

   A. The SKIN TEMP °C digital display should display all eights (88.8).

   B. All HEATER power indicators should light.

   C. After a short delay, the displays blank, the PROBE FAIL and SET POINT alarm indicators light and the audible alarm sounds and then stops.

   D. After a short delay, the PROBE FAIL and SET POINT indicators light again, the audible alarm sounds, and the HEATER power indicators go out.

   When the PROBE FAIL and SET POINT alarms stop the automatic test sequence is complete.

SKIN TEMPERATURE DISPLAY

1. SET THE PROBE SIMULATOR to 25.0°C, 36.0°C and 40.0°C; the SKIN TEMP °C display should be accurate to within ± 0.1°C for all settings.

2. DEPRESS THE CAL CHECK SWITCH; the SKIN TEMP display should indicate 36.0 ± 0.1°C to indicate that the unit is calibrated.

HEATER LEVEL

1. SET THE °C SWITCH on the Probe Simulator to 36.°C.

2. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C; two or three HEATER level indicators should be illuminated.

3. PROBE FAILURE ALARM (SHORTED)

   A. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C and the °C switch on the Probe Simulator to 36°C; the digital display should indicate 36.0°C.

   B. SET THE °C SWITCH on the Probe Simulator to SHORT. The digital display should blank continuously or intermittently.

   C. AFTER A 14 to 20 SECOND DELAY, a continuous alarm* should sound, the PROBE FAIL and SET POINT indicators should flash, and HEATER indicators should be off. This alarm condition cannot be reset until the alarm condition is corrected.

   D. TO RESET THE CIRCUIT, set the °C switch on the Probe Simulator to 36°C and depress the SILENCE/RESET switch; the unit should return to normal operating condition.

4. PROBE FAILURE ALARM (OPEN)

   A. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C and the °C switch on the Probe Simulator to 36°C; the digital display should indicate 36.0°C.

   B. SET THE °C SWITCH on the Probe Simulator to OPEN. The digital display should blank continuously or intermittently.

   C. AFTER A 14 TO 20 SECOND DELAY, a continuous alarm* should sound, the PROBE FAIL and SET POINT indicators should flash, and HEATER indicators should be off. This alarm condition cannot be reset until the alarm condition is corrected.

   D. TO RESET THE CIRCUIT, set the °C switch on the Probe Simulator to 36°C and depress the SILENCE/RESET switch; the unit should return to normal operating condition.

* Controller Model CM78-1 Series 02 - a one second on/on second off chirping alarm should sound.

PROBE FAILURE ALARM (HIGH SKIN TEMPERATURE (39.0°C))

1. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C and the °C switch on the Probe Simulator to 40.0°C.

2. AFTER A 14 TO 20 SECOND DELAY, a continuous alarm* should sound, the SET POINT AND PROBE FAIL indicators should flash, and all HEATER indicators should be off. This alarm condition cannot be reset until the alarm condition is corrected.

3. TO RESET THE CIRCUIT, set the °C switch on the Probe Simulator to 36°C and depress the SILENCE/RESET switch; the unit should return to normal operating condition.

HIGH SKIN TEMPERATURE

1. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C, the control switch on the probe simulator to SKIN, and the °C switch on the probe simulator to 36.0°C; the digital display should indicate 36.0°C and the alarms should not be activated. Typically, two heater indicators should be lit.

2. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 34.8°C. All heater indicators should be off.

3. AFTER A 14 TO 20 SECOND DELAY, a continuous alarm* should sound, and the SET POINT indicator should flash.

4. TO RESET THE CIRCUIT, set the SKIN TEMP °C thumbwheel switches on the Controller to 36.0°C; the unit should return to normal operating condition.

LOW SKIN TEMPERATURE

1. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C, the control switch on the probe simulator to SKIN, and the °C switch on the probe simulator to 36°C; the digital display should indicate 36.0°C and the alarms should not be activated. Typically, two heater indicators should be lit.

2. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 37.2°C. All heater indicators should be lit.

3. AFTER A 14 TO 20 SECOND DELAY, a continuous alarm* should sound and the SET POINT indicator should flash.

4. DEPRESS THE SILENCE/RESET SWITCH, the alarm should be silenced but the SET POINT indicator should continue to flash. All heater indicators should be lit.

5. SET THE SKIN TEMP °C THUMBWHEEL SWITCHES on the Controller to 36.0°C. The circuit should reset automatically and the SET POINT indicator should turn off. Typically, two heater indicators should be lit.

* Controller Model CMB78-1 Series 02 - a one second on/one second off chirping alarm should sound.

5.2.6 PERFORMANCE CHECKS — MANUAL CONTROL MODE

STANDARD ALARMS DISABLED CHECK

1. SET THE CONTROL MODE SWITCH on the Controller to MANUAL; the MANUAL indicator should flash on and off continuously.

2. CONNECT THE PROBE SIMULATOR to the PATIENT PROBE connector on the Controller; set the control switch to SKIN and the °C switch to OPEN. The digital display should show random numbers and blank intermittently or continuously.

3. WAIT AT LEAST 20 SECONDS, no visual or audible alarms should occur.

   NOTE: The standard alarms (except for POWER FAIL) are disabled when operating in manual mode.

15-MINUTE TIMER CHECK

1. SET THE CONTROL MODE SWITCH TO SKIN.

2. SET THE CONTROL MODE SWITCH TO MANUAL, the MANUAL indicator should flash on and off continuously indicating that the timer is running; begin measuring elapsed time.

   IMPORTANT: If the MANUAL indicator does not flash on and off continuously, the 15-minute timer is inoperative.

3. AFTER 9 TO 12 MINUTES TOTAL ELAPSED TIME, a one second duration beep* (Manual Alert) should sound every 30 seconds; this indicates that the heater may be reset for an additional 15 minutes without the heater turning off. To check the reset circuitry, proceed as follows:

   A. Depress and hold the SILENCE/RESET switch for at least 2 seconds after the audible signal starts; this will allow time for internal circuitry to reset.

   B. After 9 to 12 minutes total elapsed time, a one second duration beep* (Manual Alert) should sound every 30 seconds.

4. AFTER 13 TO 19 MINUTES ELAPSED TIME, a steady alarm** should sound, the MANUAL indicator should stop flashing and all HEATER indicators should turn off indicating that the manual heating period has ended.

5. DEPRESS THE SILENCE/RESET SWITCH for at least 2 seconds; this resets the circuitry and the complete cycle should repeat.

* Controller Model CMB78-1 Series 02 - a one second chirp should sound.

** Controller Model CMB78-1 Series 02 - a one second on/one second off chirping alarm should sound.

POWER FAILURE ALARM CHECK

1. DISCONNECT THE POWER CORD from the wall receptacle or Power Module; the POWER FAIL indicator should light and the alarm should sound.

2. RECONNECT THE POWER CORD or set the WARMER ON-OFF switch to the OFF position to terminate the alarm.

5.3 TROUBLESHOOTING

5.3.1 GENERAL

Troubleshooting guides for the equipment are provided in paragraph 5.3.3 in the form of flowcharts. It is assumed that an attempt has been made to calibrate the equipment and that all cables are in good condition.

5.3.2 TEST EQUIPMENT REQUIRED

The test equipment listed below is required for troubleshooting the equipment. Equivalent test equipment may be substituted.

- Variac - General Radio Model W5MT3A (100V and 110/120V models)
- Variac - General Radio Model W20HMT3A (220/240V models)
- Digital Voltmeter - Fluke 8000A
- Extender Board - Air-Shields Part No. 78 319 70
- Oscilloscope - Tektronix 561A
- Extension Ribbon Cable - Air-Shields Part No. 78 319 20
- 2KΩ, 10W resistor (100V and 110/120V models)
- 4KΩ, 10W resistor (220/240V models)
- Probe Simulator - Air-Shields Part No. 68 900 80

NOTE: Probe Simulator Part No. 68 900 80 is also used for test and calibration of the Model C100 Infant Incubator.

5.3.3 TROUBLESHOOTING PROCEDURES

The following flowcharts are provided as an aid in localizing the cause of equipment malfunctions. The charts are intended for use in conjunction with the equipment theory of operation (Section 3) and the schematic diagrams (Section 7). It is assumed that the Operational Checkout Procedure (paragraph 2.3) has been performed, and that the Test and Calibration Procedures (paragraph 5.2) have been attempted.

When using the flowcharts, do not skip steps. The flowcharts have been designed to minimize the number of checks required to localize the problem area and isolate the defective component.

If the problem area is known, proceed directly to the appropriate flowchart; however, if the problem area cannot be immediately defined, first perform the Power Module output voltage test that follows.

POWER MODULE VOLTAGE TEST

TEST HOOKUP

1. REMOVE THE CONTROLLER from the Mounting Post (refer to paragraph 5.4.3).

2. REMOVE PCB3 from the Controller and reinstall using Extender Board, Part No. 78 319 70 to provide access to test points and adjustments.

3. USING EXTENSION RIBBON CABLE, Part No. 78 319 20, reconnect the Controller to the Power Module.

4. CONNECT THE PROBE SIMULATOR Part No. 68 900 80 to the PATIENT PROBE jack on the Controller and set the °C switch to 36.0°C.

5. SET THE °C THUMBWHEEL SWITCHES on the Controller to 36.0°C.

6. CONNECT LINE VOLTAGE to the Power Module using a Variac. Adjust the line voltage as follows:

   110/120V Power Module; 115 VAC ± 1.0 VAC
   220/240V Power Module; 230 VAC ± 1.0 VAC
   100V Power Module; 100 VAC ± 1.0 VAC

7. SET THE WARMER SWITCH on the Warmer Housing to the ON-1 position.

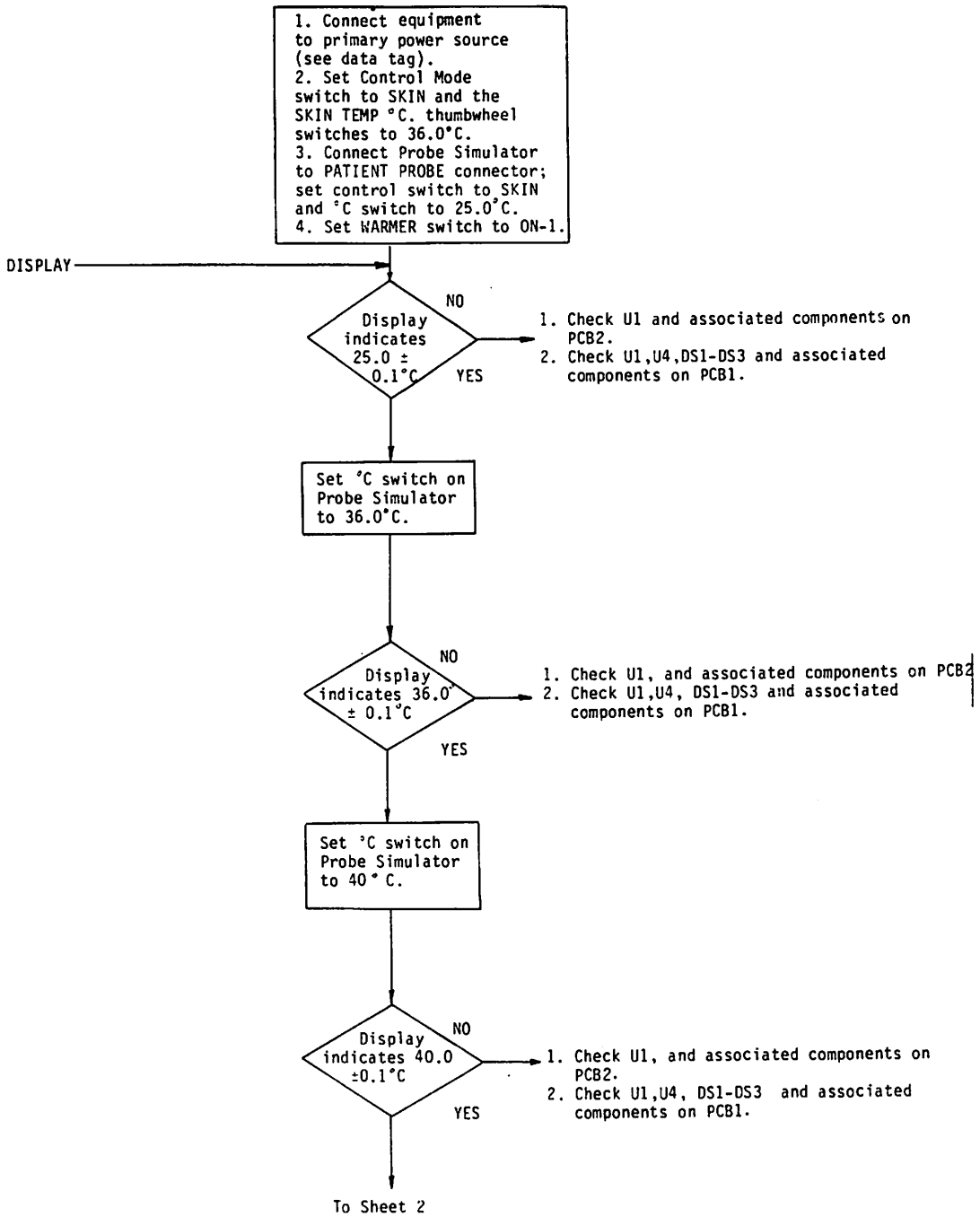
PROCEDURE

1. USING A DIGITAL VOLTMETER, check that the Power Module output voltages are within the limits indicated below. The test points are located on connector J3 of PCB3 in the Controller.

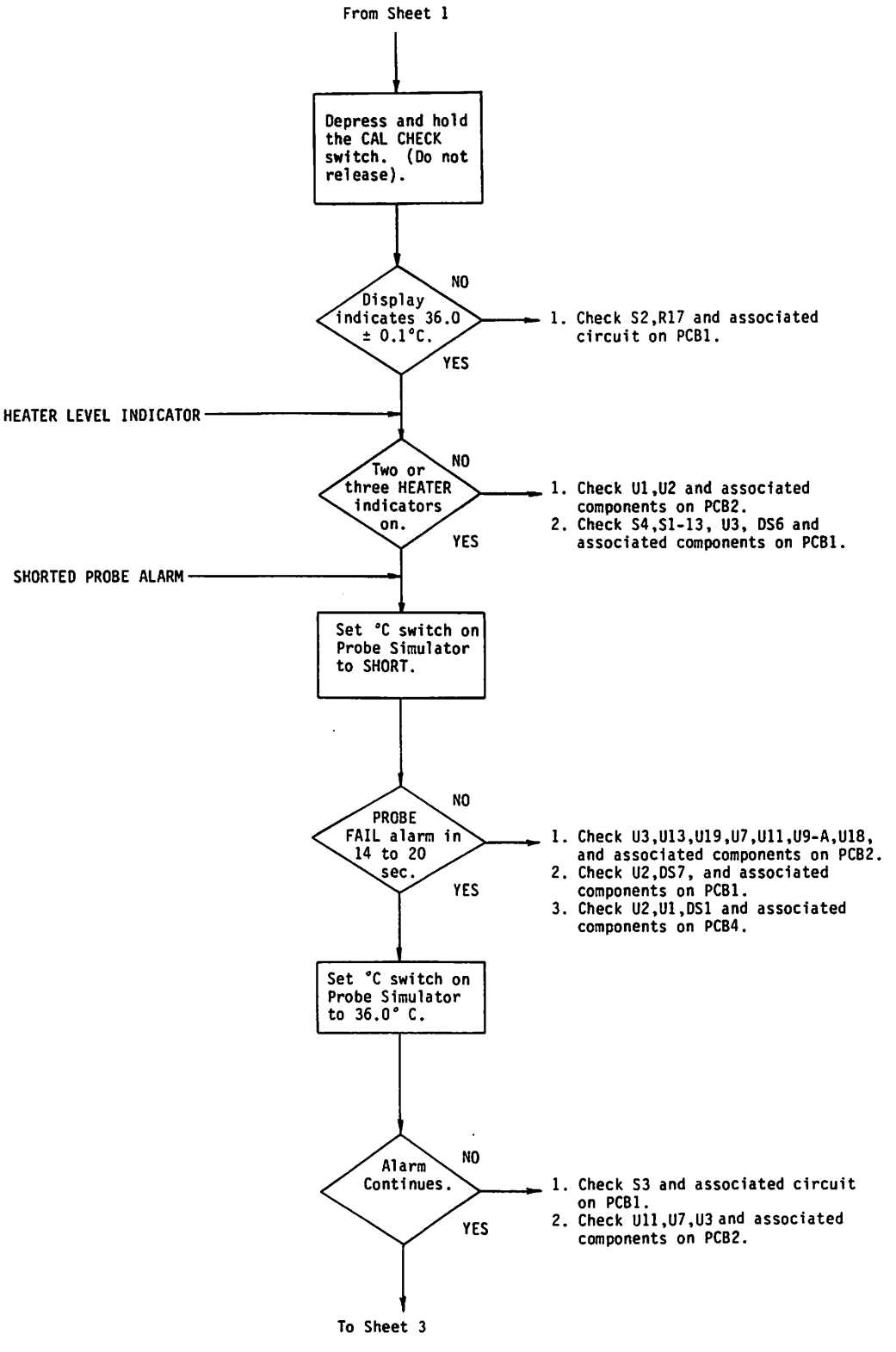
	FROM	TO(GND)	VOLTAGE	MAXIMUM RIPPLE P-P
	J3-7	J3-3	+5.0 ± 1.0 VDC	1.0 V
*	J3-9	J3-3	+12.6 ± 50 mV	10.0 mV
	J3-14	J3-3	+21.0 ± 1.0 VDC (+18.75 in 220/240V units)	1.5 V
*	J3-19	J3-3	-12.0 ± 50 mV	20.0 mV
*	J3-23	J3-3	+5.0 ± 50 mV	10.0 mV

* Reading must not vary more than 0.2V over following range of applied voltage:

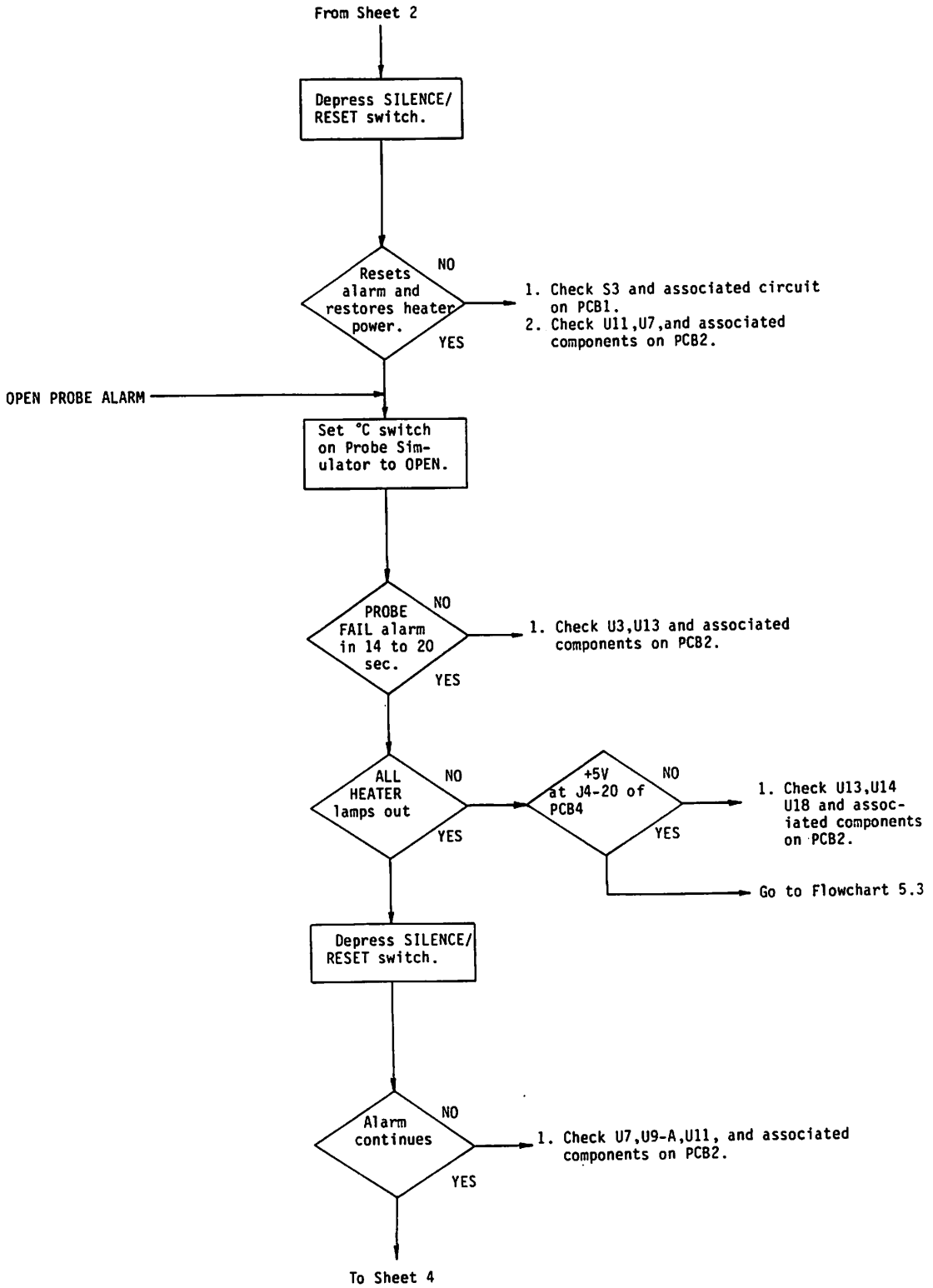
110/120V Power Module; 99 to 132 VAC
220/240V Power Module; 198 to 264 VAC
100V Power Module; 90 to 110 VAC


1. Connect equipment to primary power source (see data tag).
2. Set Control Mode switch to SKIN and the SKIN TEMP °C. thumbwheel switches to 36.0°C.
3. Connect Probe Simulator to PATIENT PROBE connector; set control switch to SKIN and °C switch to 25.0°C.
4. Set WARMER switch to ON-1.
DISPLAY
Display indicates 25.0 ± 0.1°C
NO
YES
1. Check U1 and associated components on PCB2.
2. Check U1,U4,DS1-DS3 and associated components on PCB1.
Set °C switch on Probe Simulator to 36.0°C.
Display indicates 36.0° ± 0.1°C
NO
YES
1. Check U1, and associated components on PCB2
2. Check U1,U4, DS1-DS3 and associated components on PCB1.
Set °C switch on Probe Simulator to 40° C.
Display indicates 40.0 ±0.1°C
NO
YES
1. Check U1, and associated components on PCB2.
2. Check U1,U4, DS1-DS3 and associated components on PCB1.
To Sheet 2

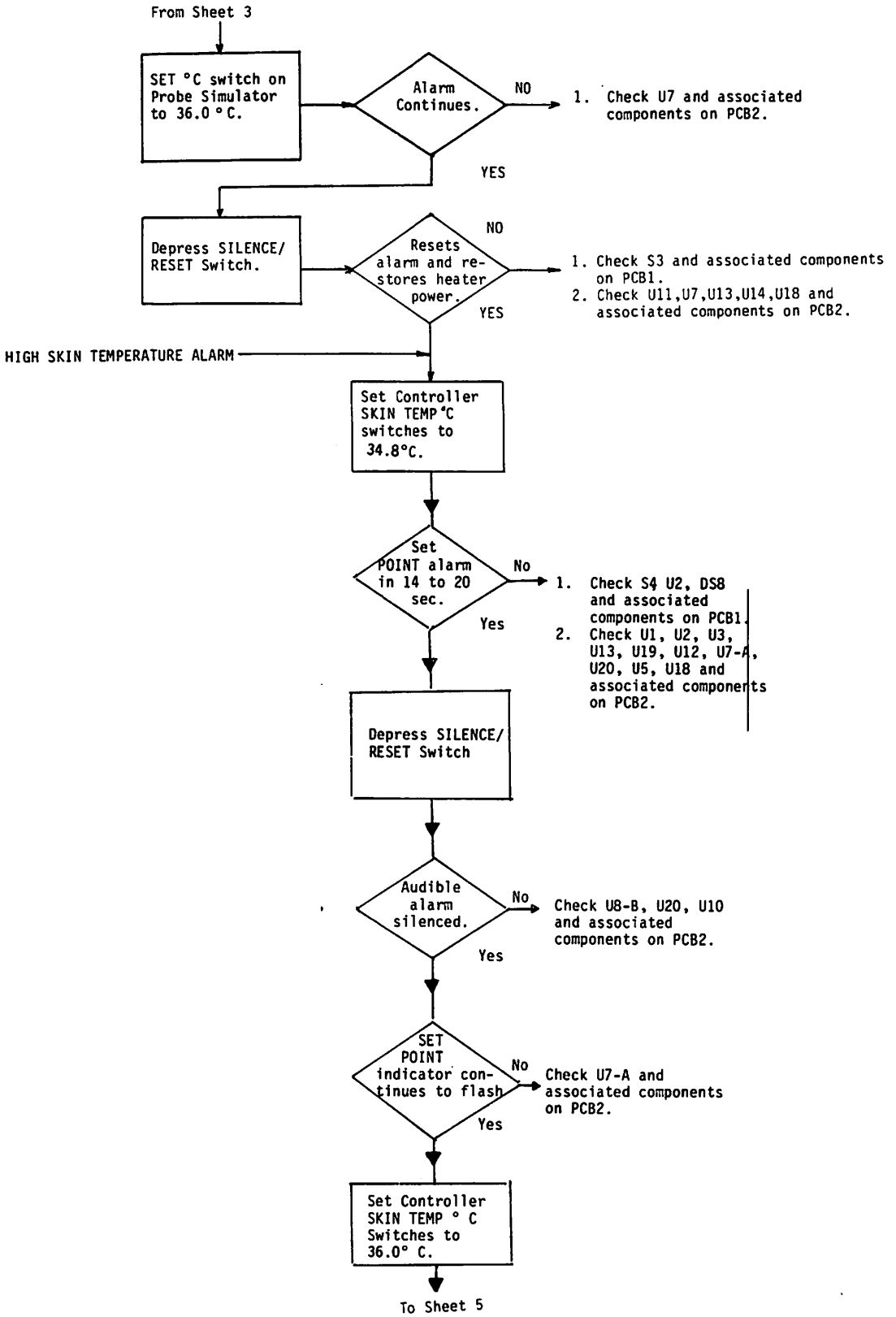
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 1 of 9)


From Sheet 1
Depress and hold the CAL CHECK switch. (Do not release).
Display indicates 36.0 ± 0.1°C.
NO
1. Check S2,R17 and associated circuit on PCB1.
YES
HEATER LEVEL INDICATOR
Two or three HEATER indicators on.
NO
1. Check U1,U2 and associated components on PCB2.
2. Check S4,S1-13, U3, DS6 and associated components on PCB1.
YES
SHORTED PROBE ALARM
Set °C switch on Probe Simulator to SHORT.
PROBE FAIL alarm in 14 to 20 sec.
NO
1. Check U3,U13,U19,U7,U11,U9-A,U18, and associated components on PCB2.
2. Check U2,DS7, and associated components on PCB1.
3. Check U2,U1,DS1 and associated components on PCB4.
YES
Set °C switch on Probe Simulator to 36.0° C.
Alarm Continues.
NO
1. Check S3 and associated circuit on PCB1.
2. Check U11,U7,U3 and associated components on PCB2.
YES
To Sheet 3

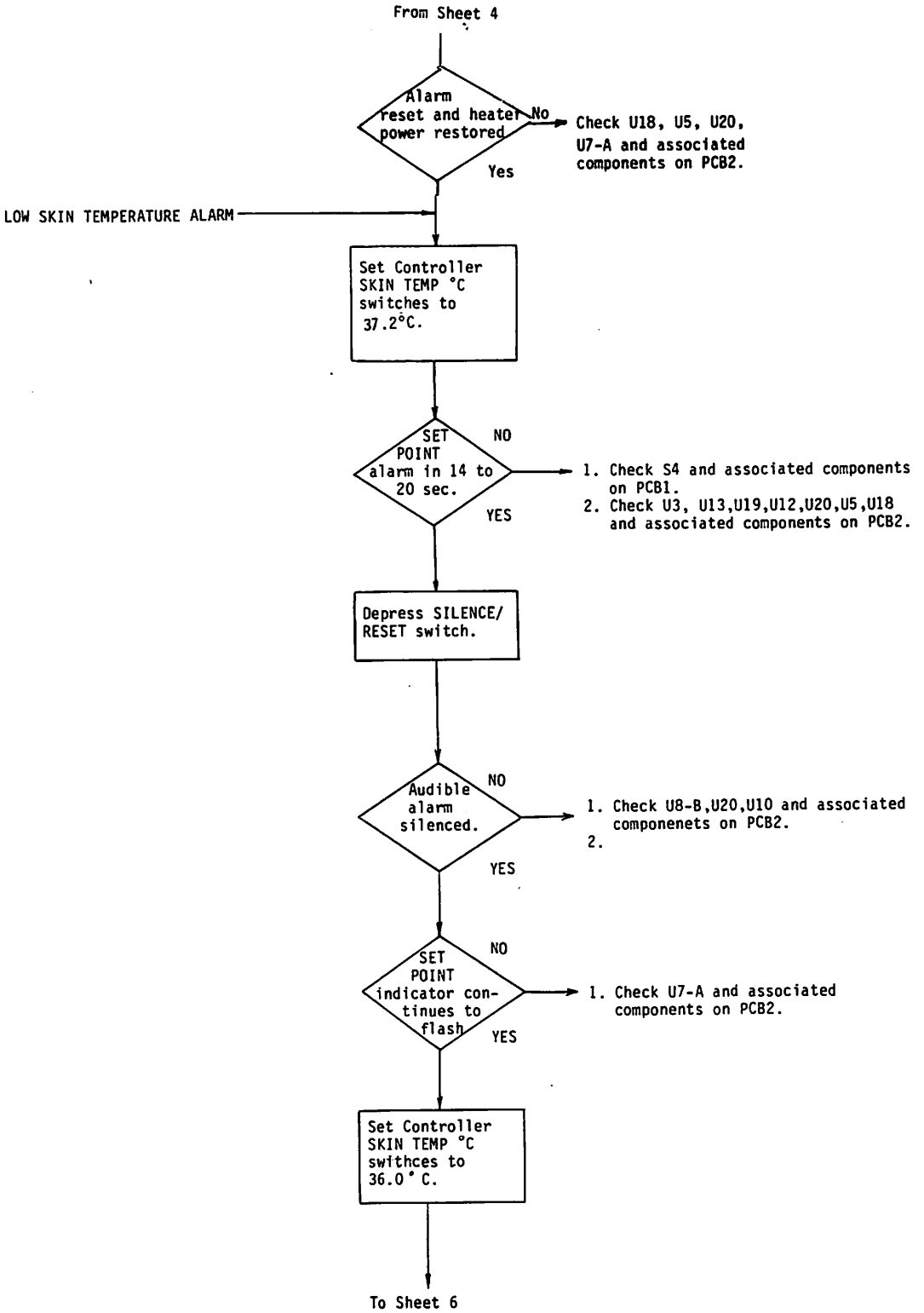
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 2 of 9)



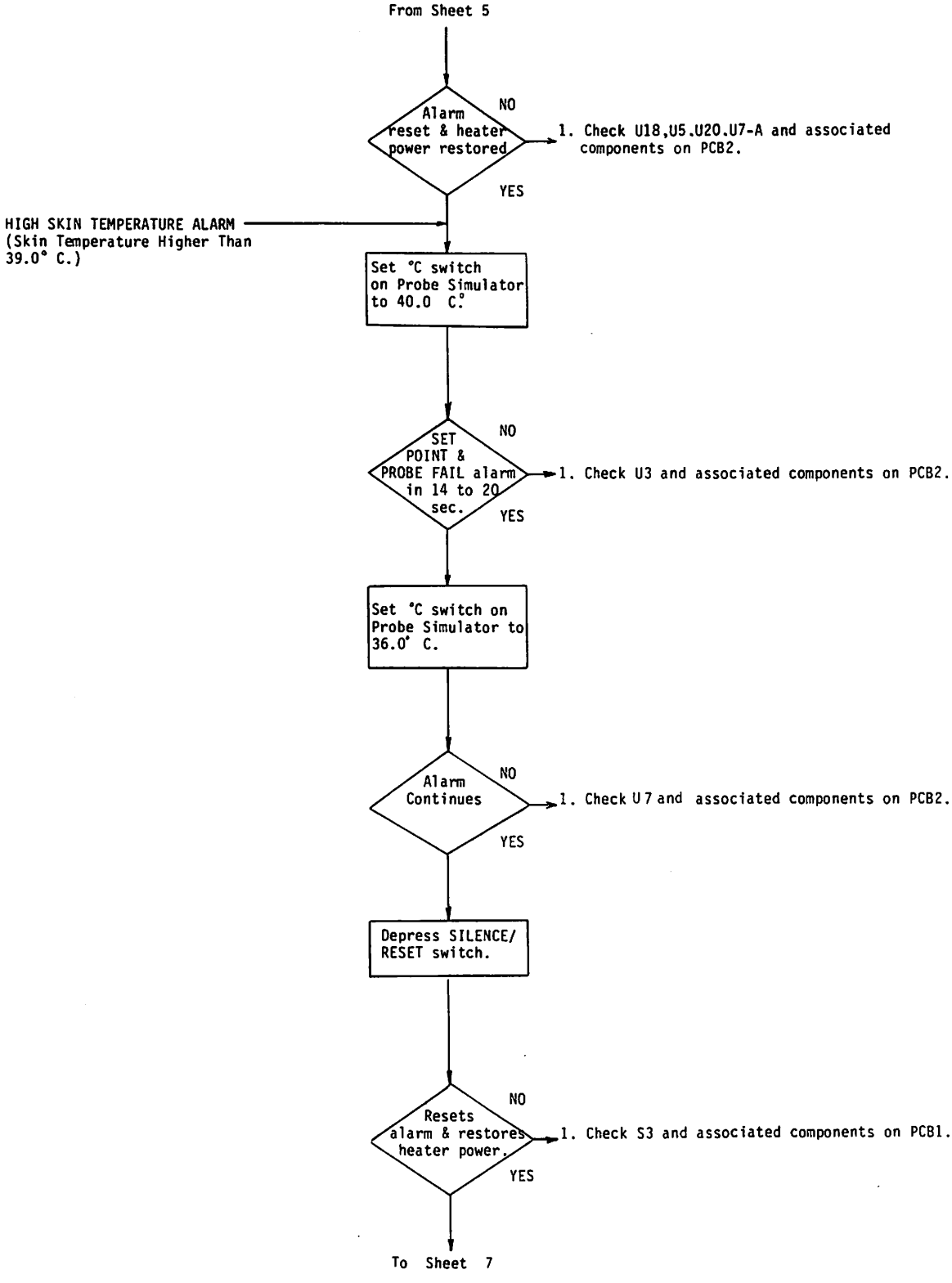
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 3 of 9)


From Sheet 3
SET °C switch on Probe Simulator to 36.0 °C.
Alarm Continues.
NO
1. Check U7 and associated components on PCB2.
YES
Depress SILENCE/ RESET Switch.
Resets alarm and re-stores heater power.
NO
1. Check S3 and associated components on PCB1.
2. Check U11,U7,U13,U14,U18 and associated components on PCB2.
YES
HIGH SKIN TEMPERATURE ALARM
Set Controller SKIN TEMP °C switches to 34.8°C.
Set POINT alarm in 14 to 20 sec.
No
1. Check S4 U2, DS8 and associated components on PCB1.
2. Check U1, U2, U3, U13, U19, U12, U7-A, U20, U5, U18 and associated components on PCB2.
Yes
Depress SILENCE/ RESET Switch
Audible alarm silenced.
No
Check U8-B, U20, U10 and associated components on PCB2.
Yes
SET POINT indicator con-tinues to flash
No
Check U7-A and associated components on PCB2.
Yes
Set Controller SKIN TEMP ° C Switches to 36.0° C.
To Sheet 5

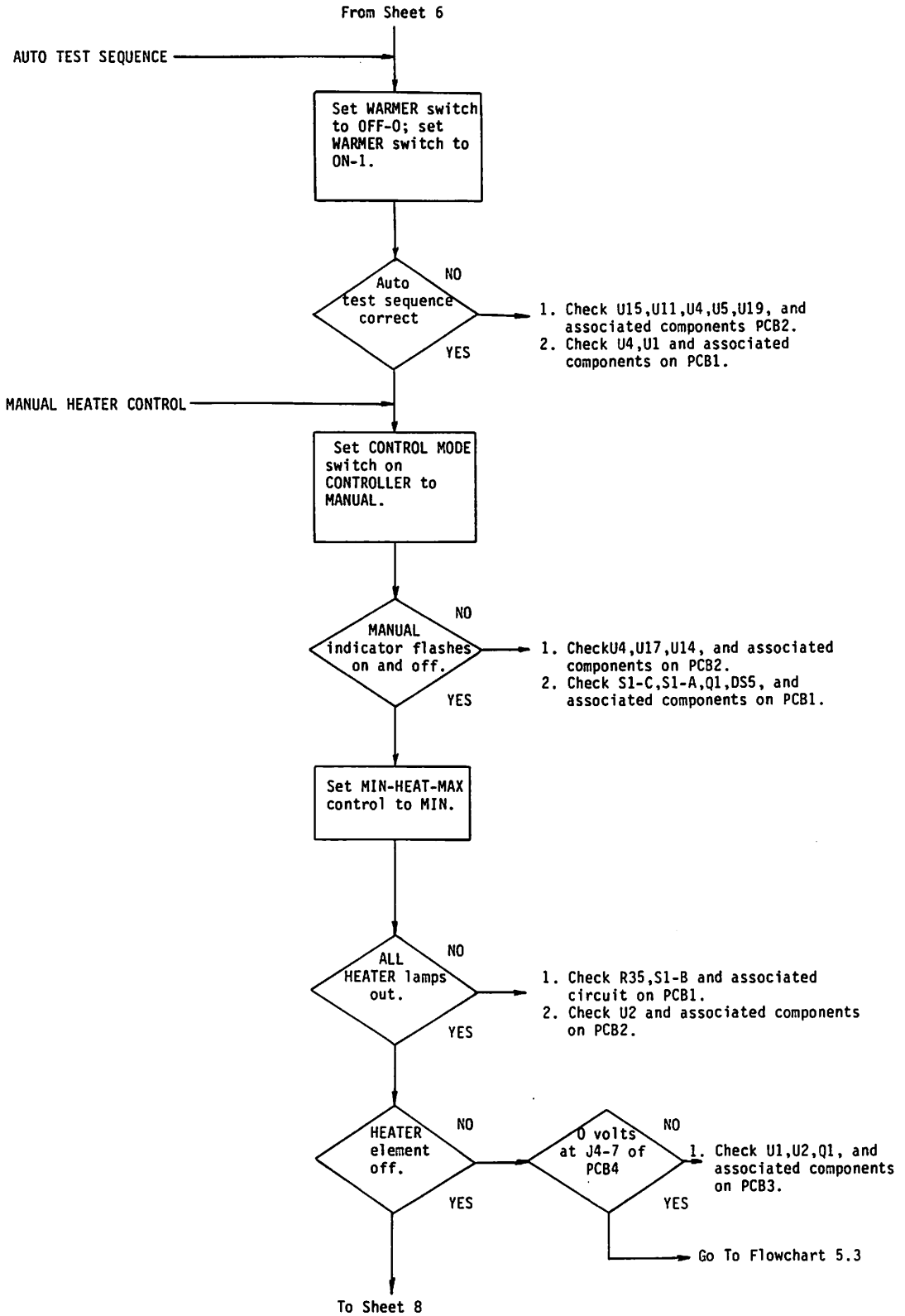
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 4 of 9)


From Sheet 4
Alarm reset and heater power restored
No
Check U18, U5, U20, U7-A and associated components on PCB2.
Yes
LOW SKIN TEMPERATURE ALARM
Set Controller SKIN TEMP °C switches to 37.2°C.
SET POINT alarm in 14 to 20 sec.
NO
1. Check S4 and associated components on PCB1.
2. Check U3, U13,U19,U12,U20,U5,U18 and associated components on PCB2.
YES
Depress SILENCE/ RESET switch.
Audible alarm silenced.
NO
1. Check U8-B,U20,U10 and associated componenets on PCB2.
2.
YES
SET POINT indicator continues to flash
NO
1. Check U7-A and associated components on PCB2.
YES
Set Controller SKIN TEMP °C swithces to 36.0° C.
To Sheet 6

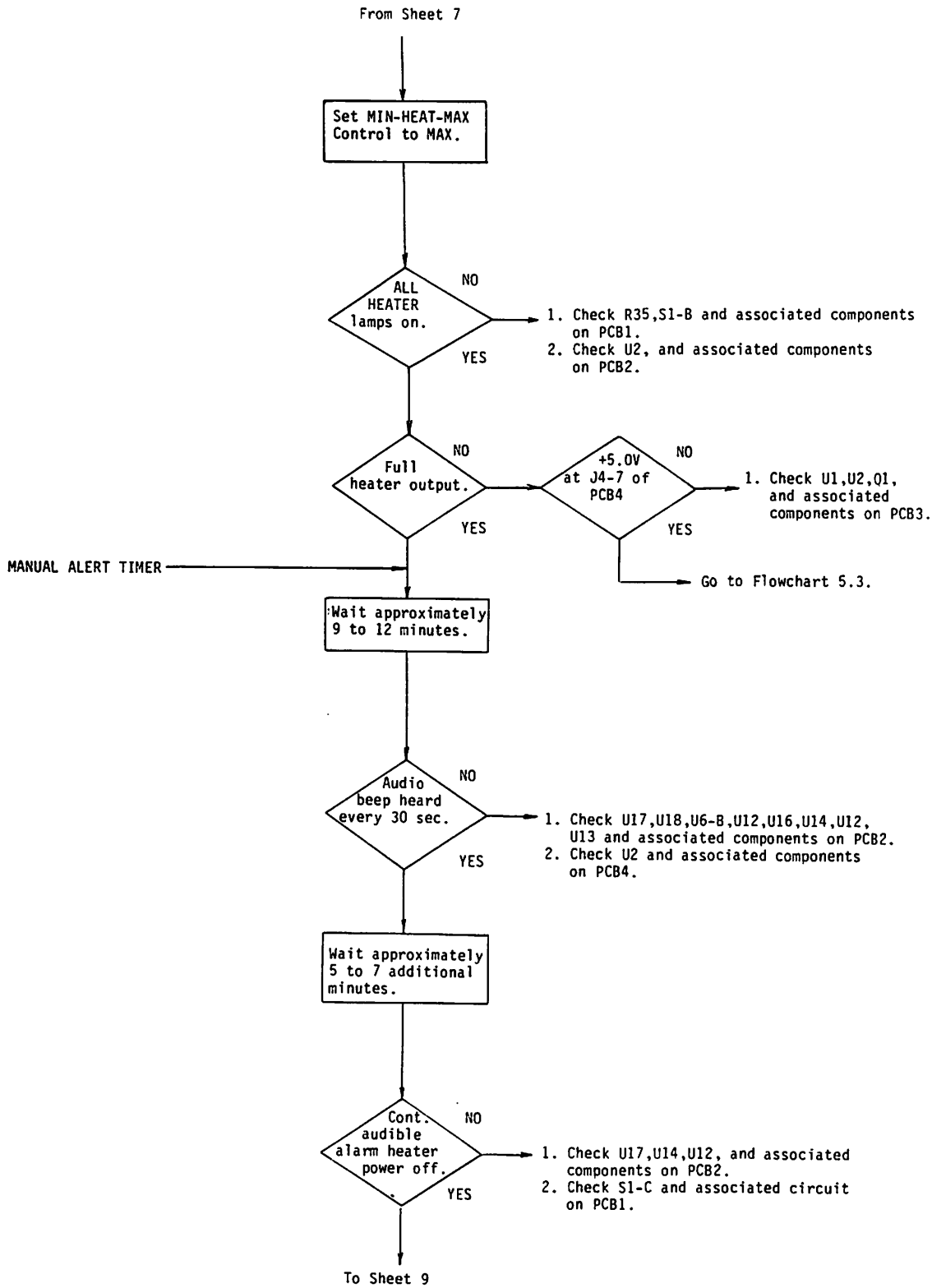
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 5 of 9)


From Sheet 5
Alarm reset & heater power restored
NO
1. Check U18,U5.U20.U7-A and associated components on PCB2.
YES
HIGH SKIN TEMPERATURE ALARM (Skin Temperature Higher Than 39.0° C.)
Set °C switch on Probe Simulator to 40.0 C°
SET POINT & PROBE FAIL alarm in 14 to 20 sec.
NO
1. Check U3 and associated components on PCB2.
YES
Set °C switch on Probe Simulator to 36.0° C.
Alarm Continues
NO
1. Check U7 and associated components on PCB2.
YES
Depress SILENCE/ RESET switch.
Resets alarm & restores heater power.
NO
1. Check S3 and associated components on PCB1.
YES
To Sheet 7

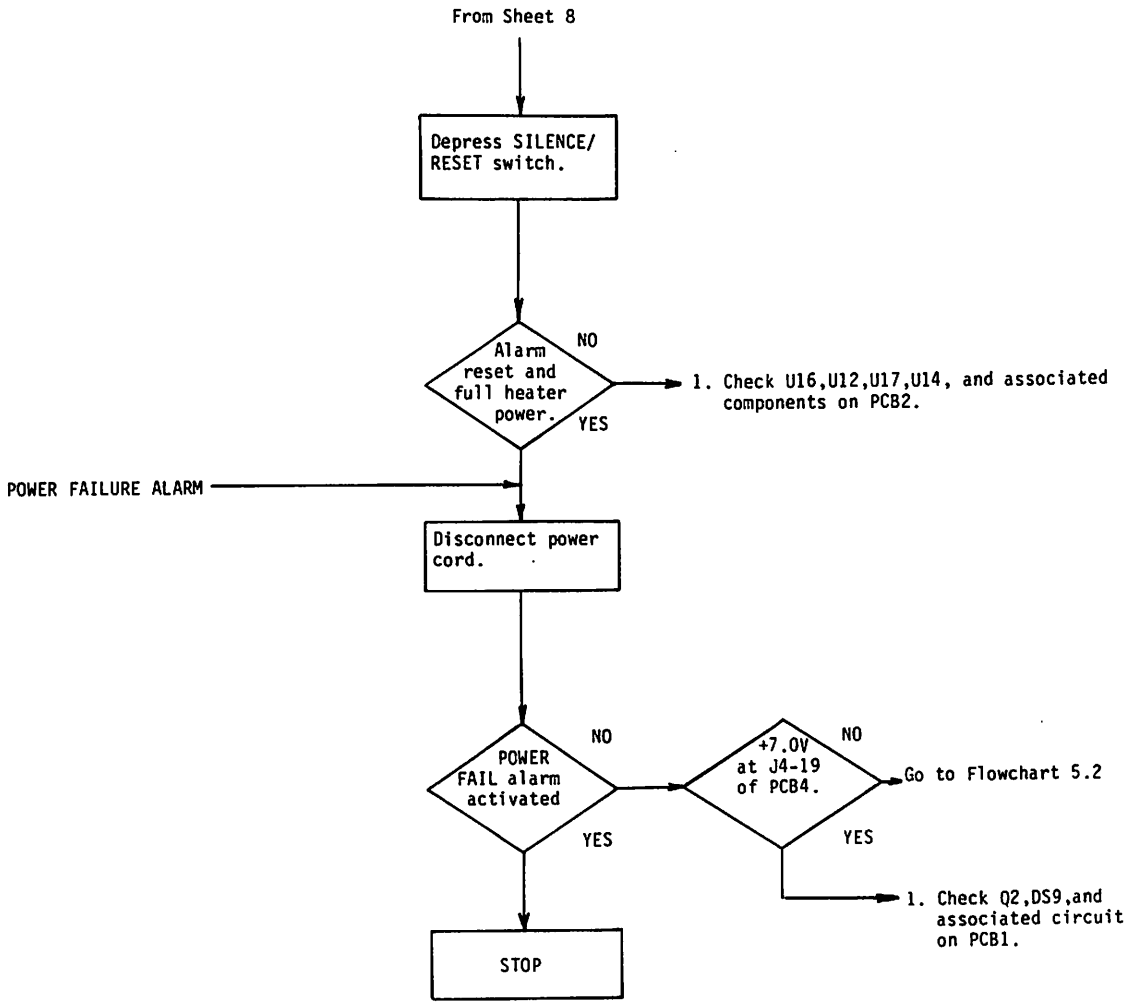
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 6 of 9)


From Sheet 6
AUTO TEST SEQUENCE
Set WARMER switch to OFF-0; set WARMER switch to ON-1.
Auto test sequence correct
NO
YES
1. Check U15,U11,U4,U5,U19, and associated components PCB2.
2. Check U4,U1 and associated components on PCB1.
MANUAL HEATER CONTROL
Set CONTROL MODE switch on CONTROLLER to MANUAL.
MANUAL indicator flashes on and off.
NO
YES
1. CheckU4,U17,U14, and associated components on PCB2.
2. Check S1-C,S1-A,Q1,DS5, and associated components on PCB1.
Set MIN-HEAT-MAX control to MIN.
ALL HEATER lamps out.
NO
YES
1. Check R35,S1-B and associated circuit on PCB1.
2. Check U2 and associated components on PCB2.
HEATER element off.
NO
YES
0 volts at J4-7 of PCB4
NO
YES
1. Check U1,U2,Q1, and associated components on PCB3.
Go To Flowchart 5.3
To Sheet 8

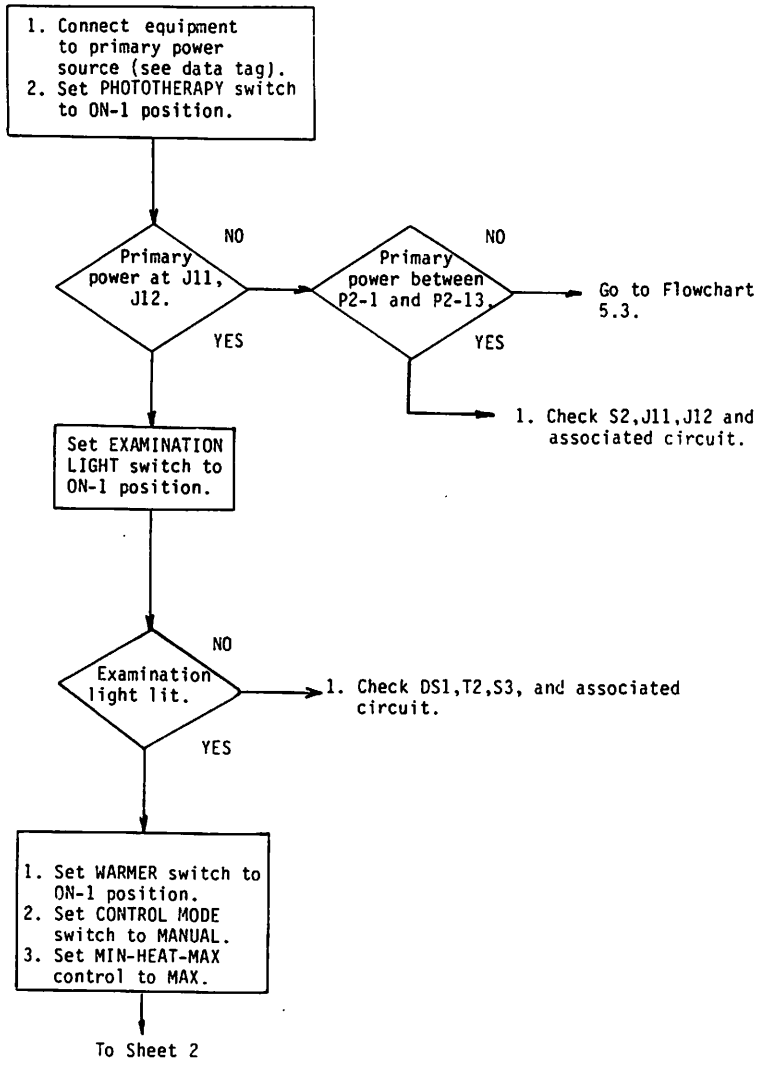
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 7 of 9)


From Sheet 7
Set MIN-HEAT-MAX Control to MAX.
ALL HEATER lamps on.
NO
YES
1. Check R35,S1-B and associated components on PCB1.
2. Check U2, and associated components on PCB2.
Full heater output.
NO
YES
+5.0V at J4-7 of PCB4
NO
YES
1. Check U1,U2,Q1, and associated components on PCB3.
Go to Flowchart 5.3.
MANUAL ALERT TIMER
Wait approximately 9 to 12 minutes.
Audio beep heard every 30 sec.
NO
YES
1. Check U17,U18,U6-8,U12,U16,U14,U12, U13 and associated components on PCB2.
2. Check U2 and associated components on PCB4.
Wait approximately 5 to 7 additional minutes.
Cont. audible alarm heater power off.
NO
YES
1. Check U17,U14,U12, and associated components on PCB2.
2. Check S1-C and associated circuit on PCB1.
To Sheet 9

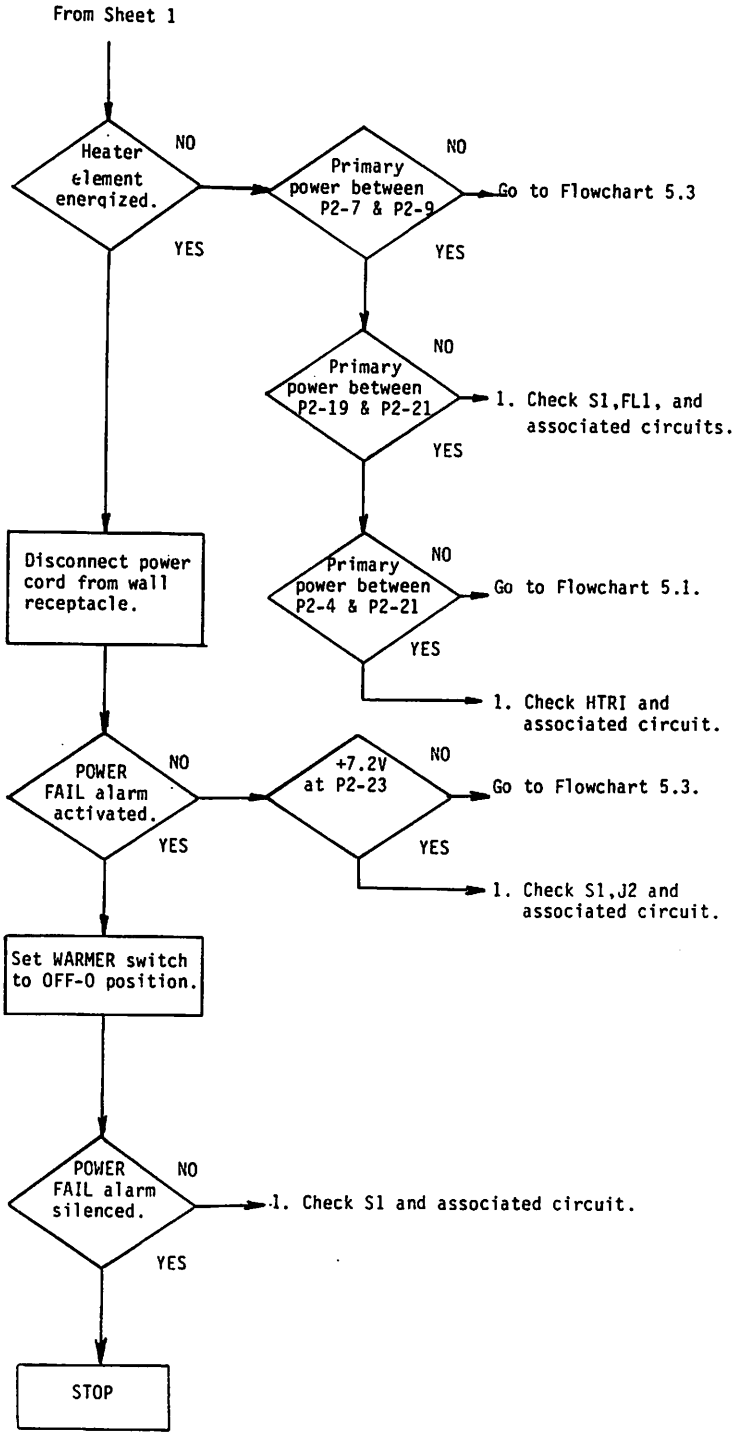
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 8 of 9)



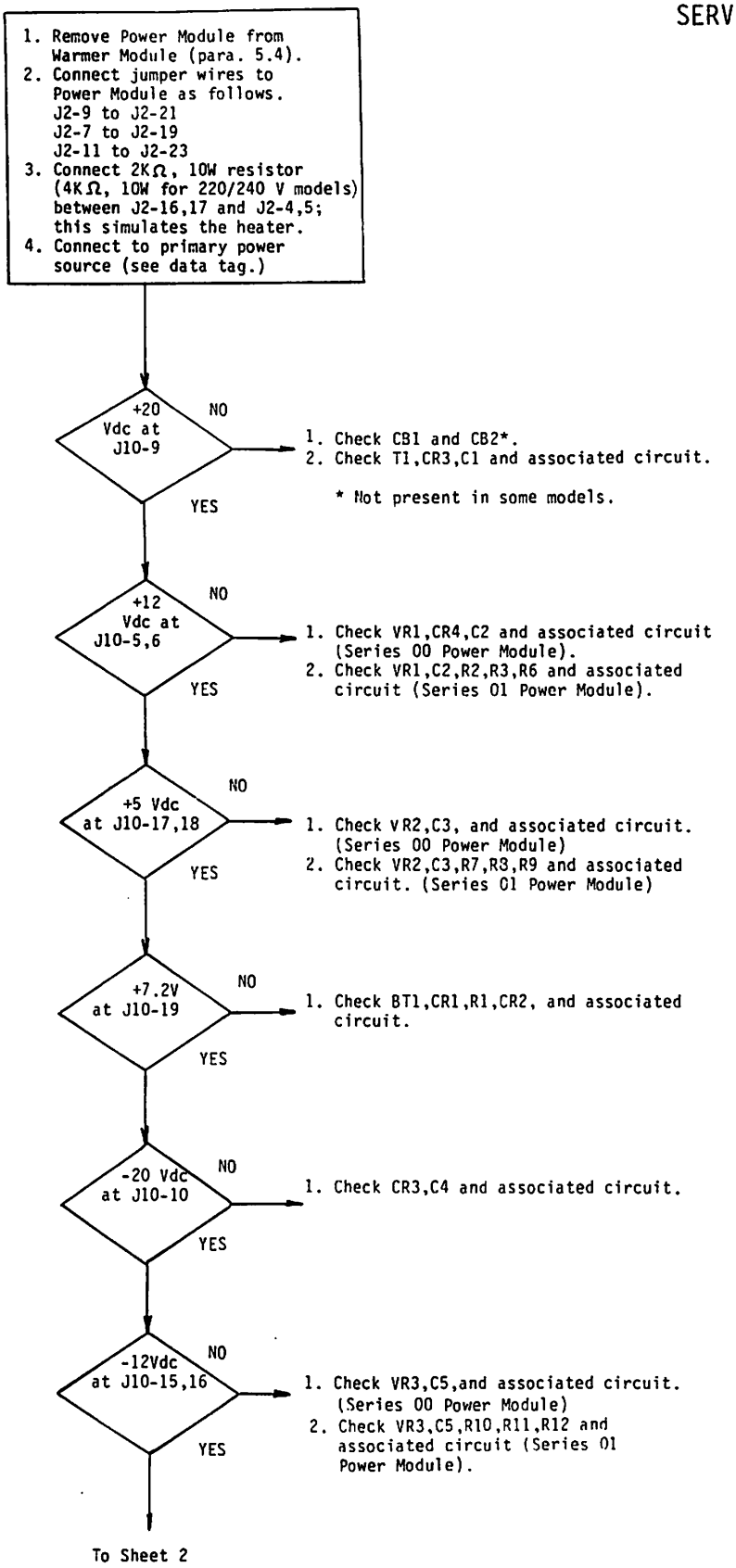
FLOWCHART 5.1 CONTROLLER MODULE TROUBLESHOOTING
(Sheet 9 of 9)


1. Connect equipment to primary power source (see data tag).
2. Set PHOTOTHERAPY switch to ON-1 position.
Primary power at J11, J12.
NO
YES
Primary power between P2-1 and P2-13.
NO
YES
Go to Flowchart 5.3.
1. Check S2,J11,J12 and associated circuit.
Set EXAMINATION LIGHT switch to ON-1 position.
Examination light lit.
NO
1. Check DS1,T2,S3, and associated circuit.
YES
1. Set WARMER switch to ON-1 position.
2. Set CONTROL MODE switch to MANUAL.
3. Set MIN-HEAT-MAX control to MAX.
To Sheet 2

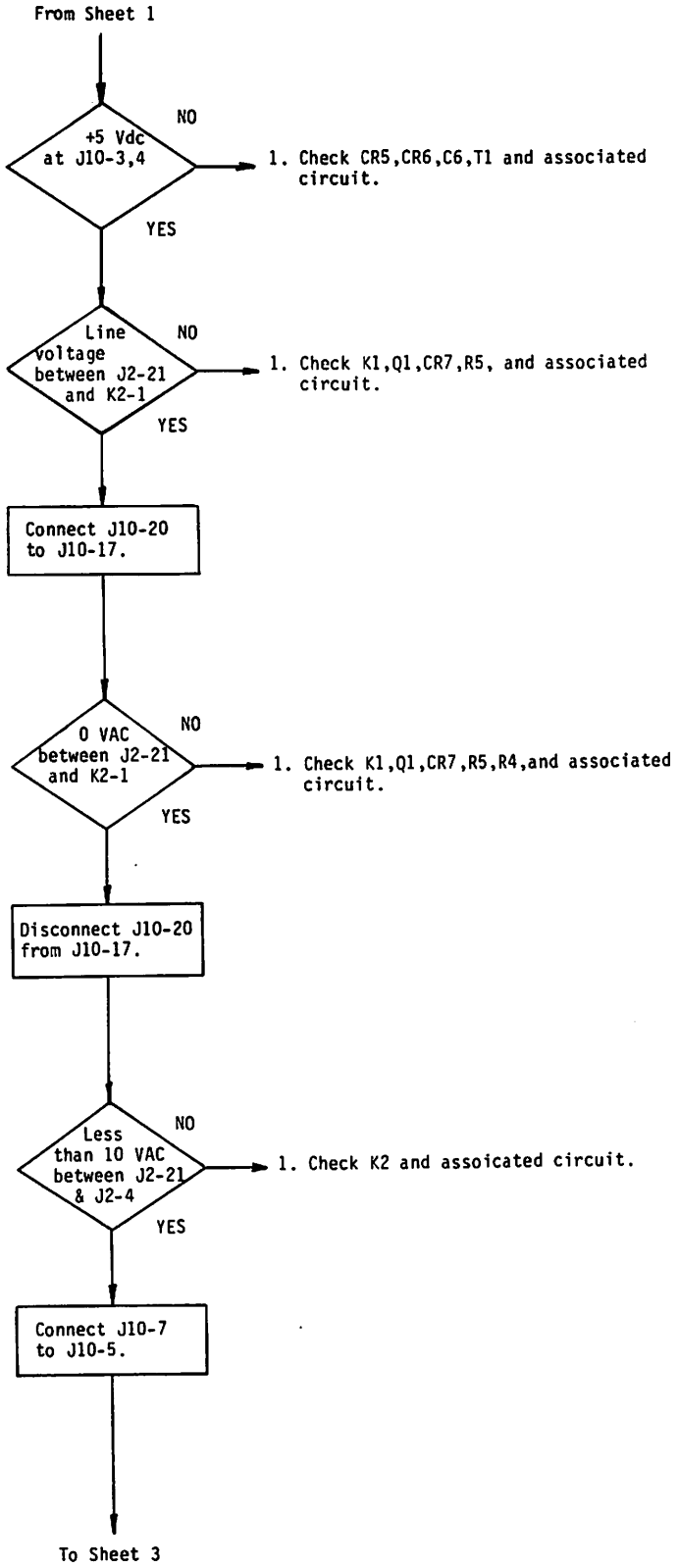
FLOWCHART 5.2 WARMER MODULE TROUBLESHOOTING
(Sheet 1 of 2)



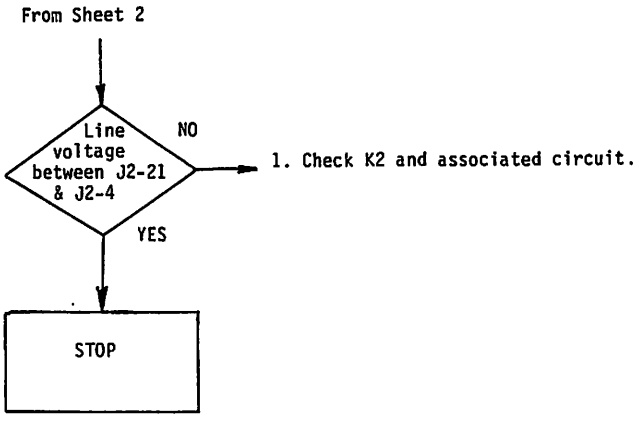
FLOWCHART 5.2 WARMER MODULE TROUBLESHOOTING
(Sheet 2 of 2)


1. Remove Power Module from Warmer Module (para. 5.4).
2. Connect jumper wires to Power Module as follows.
J2-9 to J2-21
J2-7 to J2-19
J2-11 to J2-23
3. Connect 2KΩ, 10W resistor (4KΩ, 10W for 220/240 V models) between J2-16,17 and J2-4,5; this simulates the heater.
4. Connect to primary power source (see data tag.)
+20 Vdc at J10-9
NO
1. Check CB1 and CB2*.
2. Check T1,CR3,C1 and associated circuit.
* Not present in some models.
YES
+12 Vdc at J10-5,6
NO
1. Check VR1,CR4,C2 and associated circuit (Series 00 Power Module).
2. Check VR1,C2,R2,R3,R6 and associated circuit (Series 01 Power Module).
YES
+5 Vdc at J10-17,18
NO
1. Check VR2,C3, and associated circuit. (Series 00 Power Module)
2. Check VR2,C3,R7,R8,R9 and associated circuit. (Series 01 Power Module)
YES
+7.2V at J10-19
NO
1. Check BT1,CR1,R1,CR2, and associated circuit.
YES
-20 Vdc at J10-10
NO
1. Check CR3,C4 and associated circuit.
YES
-12Vdc at J10-15,16
NO
1. Check VR3,C5,and associated circuit. (Series 00 Power Module)
2. Check VR3,C5,R10,R11,R12 and associated circuit (Series 01 Power Module).
YES
To Sheet 2

FLOWCHART 5.3 POWER MODULE TROUBLESHOOTING
(Sheet 1 of 3)



FLOWCHART 5.3 POWER MODULE TROUBLESHOOTING
(Sheet 2 of 3)



FLOWCHART 5.3 POWER MODULE TROUBLESHOOTING
(Sheet 3 of 3)

5.4 REMOVAL AND REPLACEMENT PROCEDURES

NOTE: Unless otherwise indicated, these procedures apply to the Birthing Room Warmer covered in this manual.

5.4.1 GENERAL

This section provides removal and replacement procedures for components of the Birthing Room Warmer, System 7865. Removal and replacement procedures for components other than those provided are obvious upon inspection.

5.4.2 POWER MODULE REMOVAL AND REPLACEMENT

1. DISCONNECT THE POWER CORD from the Power Module (1).

2. REFER TO FIGURE 5.2 and remove the two mounting screws (5) and washers (6) from the Power Module and carefully pull the Power Module out of the Warmer Housing (2) far enough to disconnect the interconnecting ribbon cable (3) from connector J10 (4) on PCB1.

3. REMOVE THE POWER MODULE from the Warmer Housing.

4. TO REPLACE THE POWER MODULE reverse the above procedure.

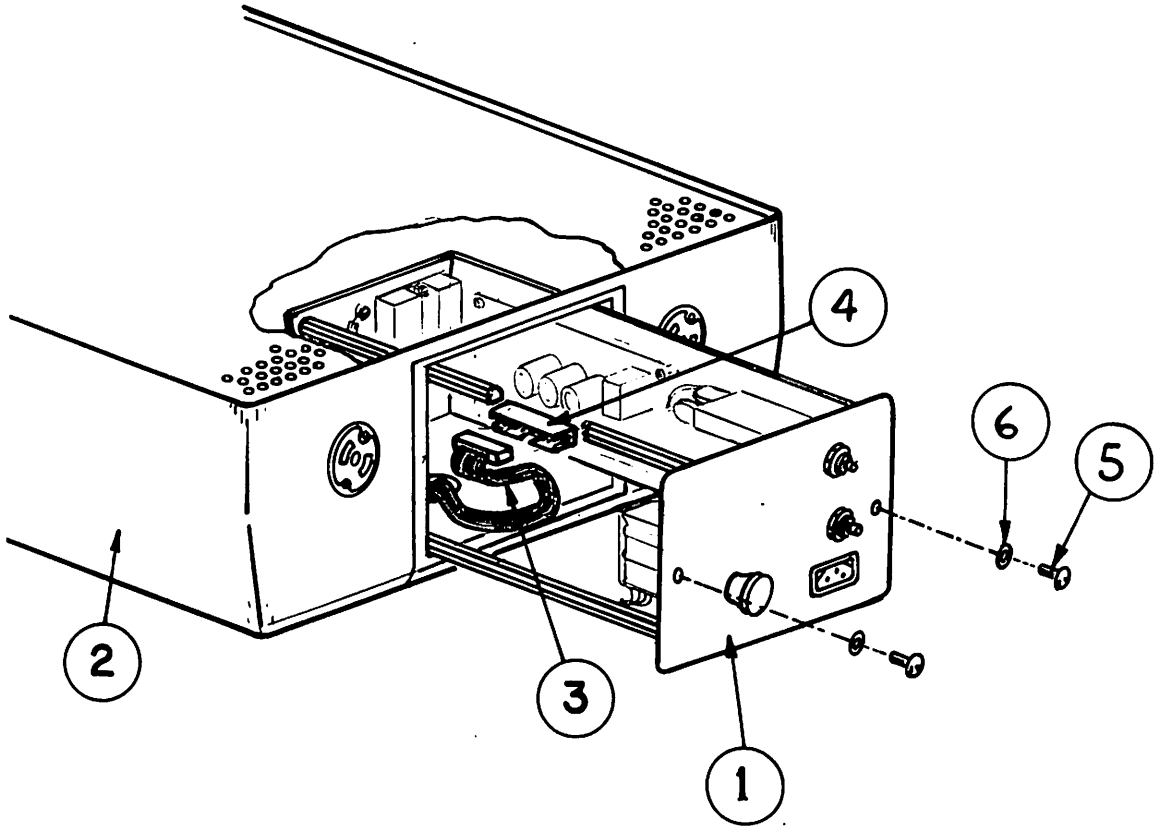


FIGURE 5.2 POWER MODULE REMOVAL AND REPLACEMENT

5.4.3 CONTROLLER MODULE REMOVAL AND REPLACEMENT

1. REFER TO FIGURE 5.3 and remove the two mounting screws (1) and lockwashers (3) that secure the Controller to the Mounting Post and unmount the Controller.

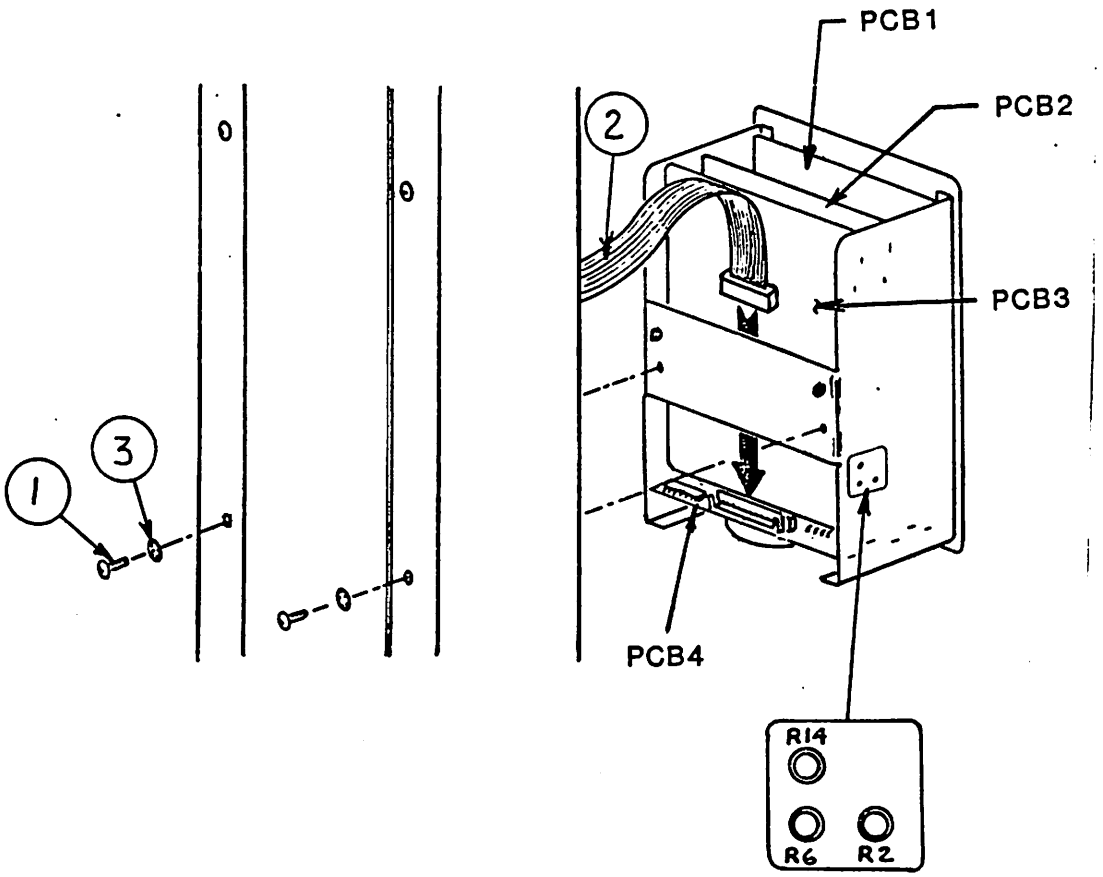


FIGURE 5.3 CONTROLLER MODULE REMOVAL AND REPLACEMENT, ADJUSTMENT AND CONNECTION POINTS

2. DISCONNECT THE INTERCONNECTING RIBBON CABLE (2) from connector J4 on PCB4 and remove the Controller from the Mounting Post.

3. TO REPLACE THE CONTROLLER, reverse the above procedure.

5.4.4 QUARTZ HEATING ELEMENT REMOVAL AND REPLACEMEMT

IMPORTANT: The Quartz Heating Element may be removed and replaced without disassembling the Warmer Module.

> WARNING: To avoid touching any hot surfaces, the Warmer Module should be turned off for at least 30 minutes before starting this procedure.

1. REFER TO FIGURE 5.4, view A, and loosen (do not remove) the mounting screw (1) that secures the curved reflector (2) to the heater support bracket.

2. RAISE THE CURVED REFLECTOR up to release it from the mounting screw and slide it toward the opposite end of the reflector assembly to release the curved reflector for removal.

   NOTE: On early production models, it may be necessary to rotate the curved reflector slightly so that it will pass through the keyhole opening in the parabolic reflector.

CAUTION:

- The Quartz heating element is a fragile component; handle with care to prevent damage.

- Do not handle the heating element with bare hands; skin oils may cause damage to the quartz heater. Use clean, lint-free cloth gloves or similar hand covering. If skin contact with the heater occurs accidentally, clean it thoroughly with alcohol before reinstalling.

3. REFER TO FIGURE 5.4, view B. Grasp the heating element (3) with both hands and push firmly toward the front of the Warmer Module to release the rear end of the heating element from the rear spring-loaded connector (4). Maintain this pressure while lowering the rear end of the heating element until it is removed from this parabolic reflector. Carefully withdraw the front end of the heating element from the front end spring-loaded connector; remove the heating element.

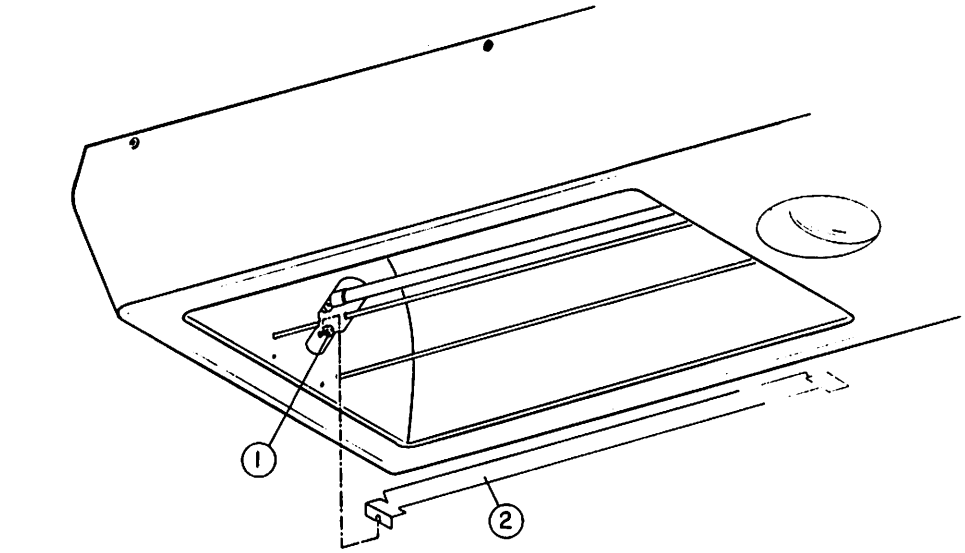
4. Install the replacement heater element by reversing the above procedure.

IMPORTANT:

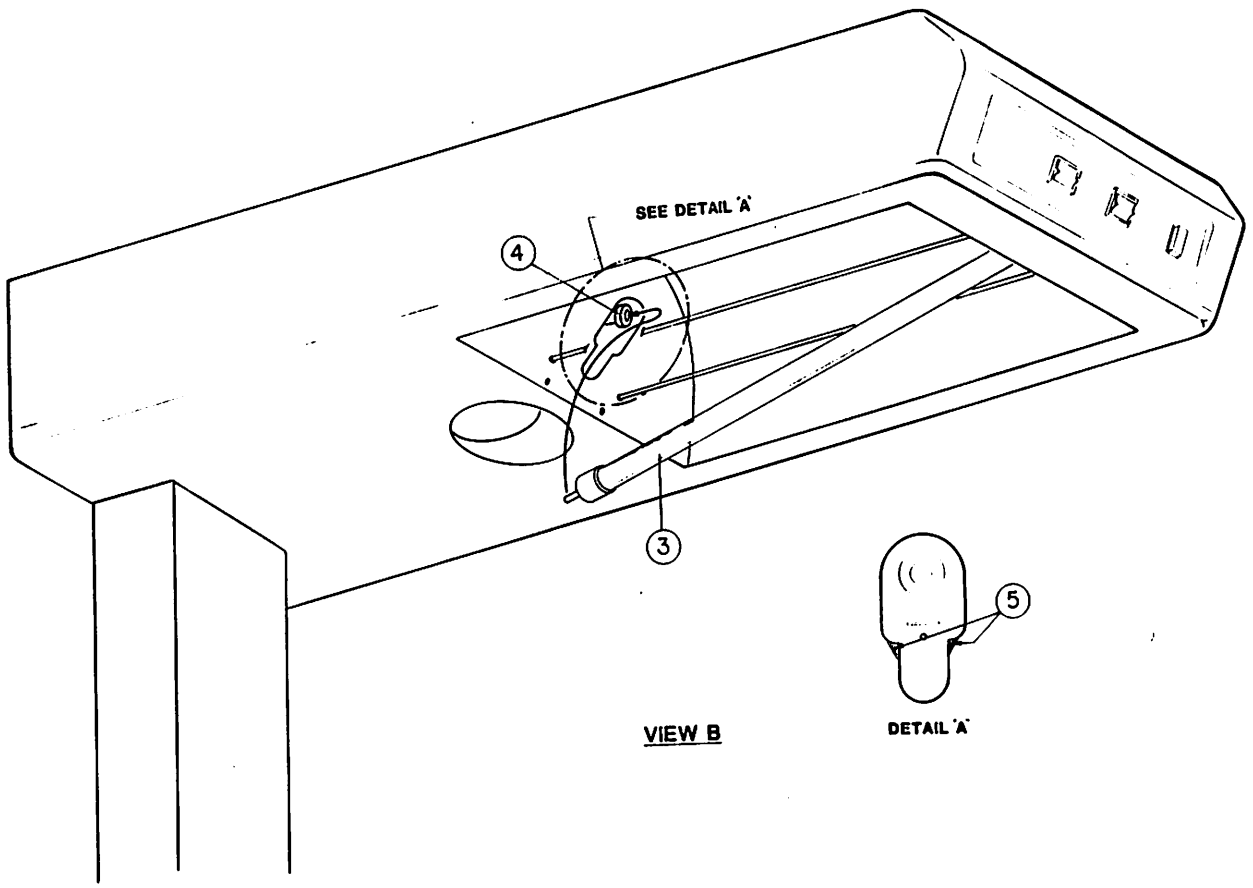
- When installing the replacement heater element, it is important that it be inserted at an angle as shown in Figure 5.4, view B. Insert one end and seat it firmly into the spring-loaded connector and then, in one motion, raise the other end and insert it into the spring-loaded connector at the opposite end.

- When installing the replacement heating element, it may be necessary to bend the tabs (5) in the connector opening slightly to provide adequate clearance in the connector opening.

  NOTE: It should be noted that later production units have an oval shaped connector opening in the reflector to provide for easier installation of the heating element.



VIEW A



VIEW B

FIGURE 5.4 QUARTZ HEATING ELEMENT REMOVAL AND REPLACEMENT

5.4.5 EXAMINATION LIGHT REMOVAL AND REPLACEMENT

1. REFER TO FIGURE 6.4. Remove the eight screws (30), lockwashers (34), flat washers (33), that secure the Warmer Top screen (12) to the Warmer Assembly and remove the screen.

2. REFER TO FIGURE 5.5 and unplug the connector (4) from the lamp (3).

3. REFER TO FIGURE 5.5 and loosen (do not remove) the two screws (1) that secure the lamp mounting bracket (2) to the Warmer Module Subassembly and remove the lamp mounting bracket and lamp. Use care to ensure that the window glass (5) is not dislodged during removal.

4. REMOVE THE LAMP from the bracket.

   CAUTION: When replacing the lamp, do not touch the conical inside portion of the lamp; damage to the lamp may result.

5. TO REPLACE THE EXAMINATION LIGHT reverse above procedure.

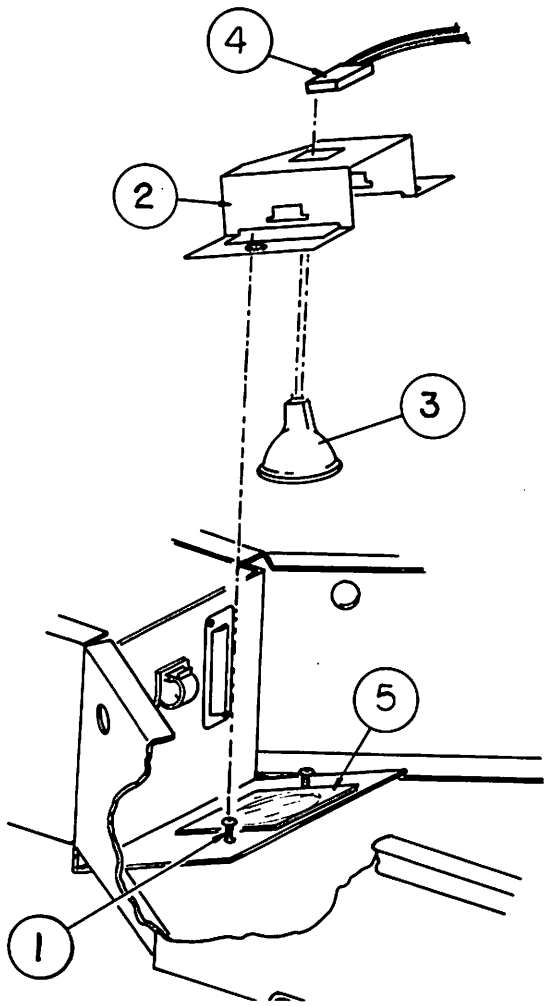


FIGURE 5.5 EXAMINATION LIGHT REMOVAL AND REPLACEMENT

5.4.6 HEATER/REFLECTOR ASSEMBLY REMOVAL AND REPLACEMENT

1. REMOVE THE WARMER MODULE AND CONTROLLER by reversing the procedure given in paragraph 2.2.3.

2. REMOVE THE POWER MODULE from the Warmer Module using the procedure given in paragraph 5.4.2.

3. REFER TO FIGURE 6.5. Remove the six screws (21) that secure the Warmer Hood (4) to the Warmer Module Subassembly (1) and remove the hood.

4. REMOVE THE FOUR SCREWS (20) that secure the Heater/Reflector Assembly (3) and remove the assembly; disconnect the heater wires.

5. TO REPLACE THE HEATER/REFLECTOR ASSEMBLY, reverse the above procedure.

5.4.7 APGAR TIMER BATTERY INSTALLATION/REPLACEMENT

THE APGAR Timer requires four AA size alkaline batteries.

A. REMOVE THE BACK COVER of the APGAR Timer.

B. INSTALL THE BATTERIES in the Timer battery holder as illustrated in Figure 5.6. Be sure to observe polarity.

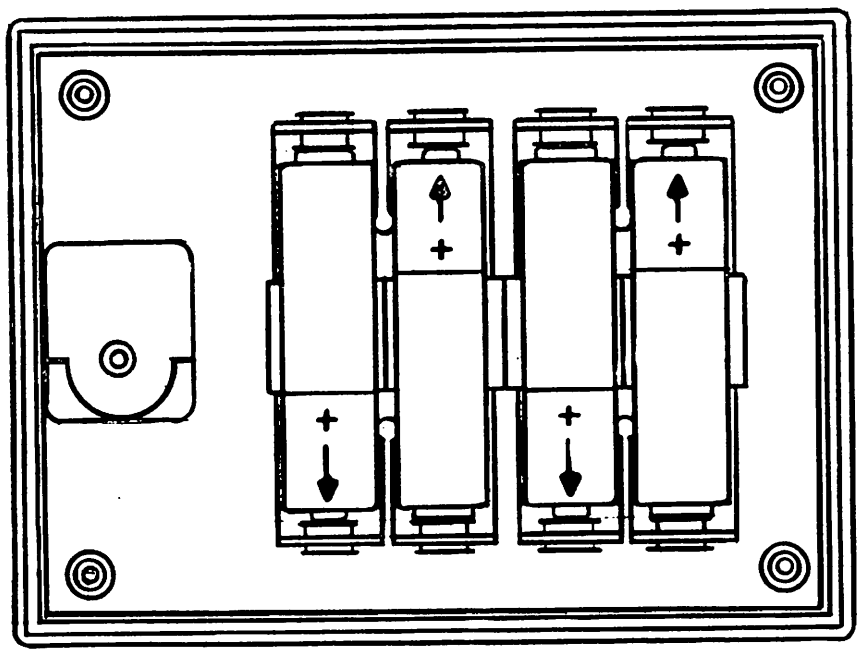


FIGURE 5.6 INSTALLATION/REPLACEMENT OF APGAR TIMER BATTERIES

SECTION 6
PARTS LIST

6.1 GENERAL

This section provides parts lists for the Air-Shields® Birthing Room Warmer, System 7865. Part Numbers of accessories and single use items are provided below.

ACCESSORIES	PART NUMBER
RESUSCITATION BOX	78 456 75
OXYGEN DELIVERY SYSTEM, YOKE AND GAUGE	78 461 70
TWIN-O-VAC™, PEDIATRIC SUCTION (200 ml Jar)	78 404 30
OXYGEN/AIR TANK HOLDER, D AND E CYLINDERS	78 459 70
FLOWMETER WITHOUT OXYGEN TAKE OFF	78 400 30
OXYGEN HOSE ASSEMBLY (3 ft.)	78 465 03
OXYGEN HOSE ASSEMBLY (10 ft.)	78 465 10
SHELF UNIT	78 165 80
I.V. POLE	78 166 71
AC RECEPTACLE BOX (6 Outlets)	78 446 70

DISPOSABLES	PART NUMBER
FILTERS FOR TWIN-O-VAC (Pkg of 100)	78 404 15
PREMI-PROBE™ SKIN TEMPERATURE PROBE (Ctn of 10)	68 209 20
PREMI-PROBE™ SKIN TEMPERATURE PROBE (Ctn of 100)	68 209 30
CRITTER COVERS™ PROBE COVERS (Ctn of 100)	68 209 46
CRITTER COVERS™ PROBE COVERS (Ctn of 600)	68 209 45
NEAT-CLIPS (0.38 dia.) (Case of 100)	68 120 53
NEAT-CLIPS (1.00 dia.) (Case of 50)	68 120 54
TOUCH UP PAINT, OFF WHITE	26 900 30

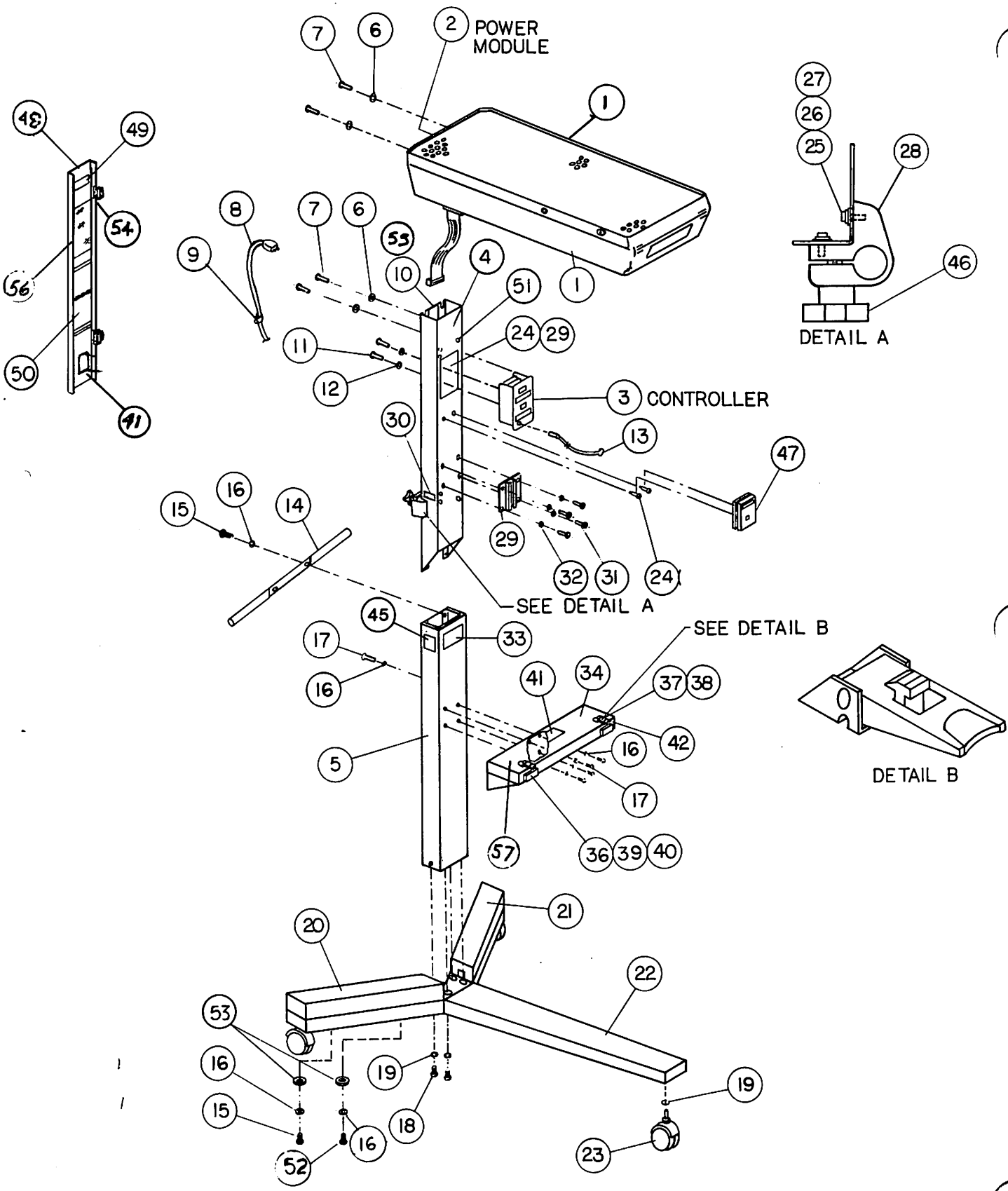


FIGURE 6.1 BIRTHING ROOM WARMER, PARTS LOCATION DIAGRAM

TABLE 6.1 BIRTHING ROOM WARMER, PARTS LIST (Sheet 1 OF 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
1		WARMER MODULE	78 291 70
2		POWER MODULE	78 306 70
3		CONTROLLER MODULE	78 304 70
4		UPPER POST ASSEMBLY (Includes Items 24 through 32)	78 270 50
5		LOWER POST ASSEMBLY (Includes Items 33 and 45)	78 290 10
6		WASHER, LK, SP #10, S CA	99 124 16
7		SCREW, 10-32 x 1/2" TR, PH, SS	99 042 01
8		AC POWER CORD (Domestic)	17 AZ 100
		AC POWER CORD (Export)	17 AZ 200
9		CABLE CLAMP, 0.31 DIA	17 732 42
10		TRIM STRIP, PLASTIC	78 161 27
11		SCREW, 6 - 32 x 3/8" TR, PH, SS	99 023 31
12		WASHER, LK, SP #6 SS	99 122 16
13		SKIN TEMPERATURE PROBE	68 209 70
14		POST HANDLE	78 291 25
15		SCREW, 1/4 - 20 x 1 3/8" CP, HX, SS	99 058 50
16		WASHER, LK, SP 1.4 SS	99 125 53
17		SCREW, 1/4 - 20 x 1/2" HX, S, CA	99 055 85
18		SCREW, 5/16 - 18 x 1 3/4" CP, HX, S, 21	99 065 10
19		WASHER, LK, SP 5/16" S, CA	99 126 32
20		WEIGHT, RIGHT HAND	78 285 15
21		WEIGHT, LEFT HAND	78 285 16
22		BASE ASSEMBLY (Includes Casters)	78 285 20
23		CASTER KIT, 3 WHEELS	78 907 80
24		SCREW, SHOULDER	78 162 34
25		SCREW, 10 - 24 x 3/8" LG, CP, SK, SS	99 047 53
26		WASHER, #10, FL, SS	99 123 62
27		WASHER, #10, LK, SP, S, CA	99 124 16
28		PIVOT BRACKET ASSY (Includes Hardware and Knob)	78 930 96
29		BRACKET ASSEMBLY, O_2 BLENDER	78 431 70
30		LABEL, SHELF LOAD LIMIT (English)	78 270 55
31		SCREW, 8-32 x 5/16 LG, TR, PH SS	99 031 05
32		WASHER, #8, LK, SP, SS	99 122 95

TABLE 6.1 BIRTHING ROOM WARMER, PARTS LIST (Sheet 2 OF 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
33		SYSTEM IDENTIFICATION LABEL	78 290 00
34		DOCKING BRACKET ASSEMBLY (Includes Items 35 through 42)	78 288 60
35		DOCKING BRACKET	78 288 35
36		DOCKING GUIDE	78 288 46
37		LATCH, TENSION	67 000 18
38		SCREW, 6-32 x 5/8" PN, PH, SS	99 023 04
39		SCREW, 8-32 x 1/2" TR, PH, SS	99 031 99
40		WASHER, LK, SP, #8, SS	99 122 95
41		INSTRUCTION LABEL	78 288 65
42		SPONGE STRIP	26 800 37
43		NOT USED	
44		SCR, 8-32 x 5/16. RD, SL, NL	99 031 07
45		MATTRESS HEIGHT LABEL	78 290 15
46		PIVOT BRACKET KNOB	78 165 11
47		APGAR TIMER, ENG, WITH BATTERIES	78 290 25
48*		UPPER POST DOOR (Includes Items 49, 50, HINGES AND HINGE HARDWARE)	
		ENGLISH	78 940 73
		SPANISH	78 940 74
		FRENCH	78 940 75
		GERMAN	78 940 76
		HINGE (2)	78 291 27
		FLAT HEAD SCREW (6)	99 024 49
		NUT 6-32, BRASS	99 105 01
		SCREW, SELF-TAP #8 (4)	99 085 21
		WASHER, FLAT #8 (4)	99 122 62
		WASHER, FLAT #6 BRASS (6)	99 122 06
49		LABEL, HEATING HAZARD	78 270 60
50		LABEL, USER PRECAUTIONS/INSTR.	78 270 65
51		BUMPER	78 293 10
52		SCREW, 1/4-20 x 15/8" CP, HX, SS	99 659 04
53		WASHER, FL, 1/4 ID x 1.000D x 0.09 TSS	99 125 35
54		SCREW, 6-32 x 3/8 FL, PH, SS	99 023 39
55		REINFORCING BRACKET	78 161 12
56		PLASTIC WINDOW	78 291 24
57		LABELS, IF UNIT HAS A RESUSCITATION BOX	78 291 45
		*If your unit has a Resuscitiation Box, order Item 28 from Table 6.17	

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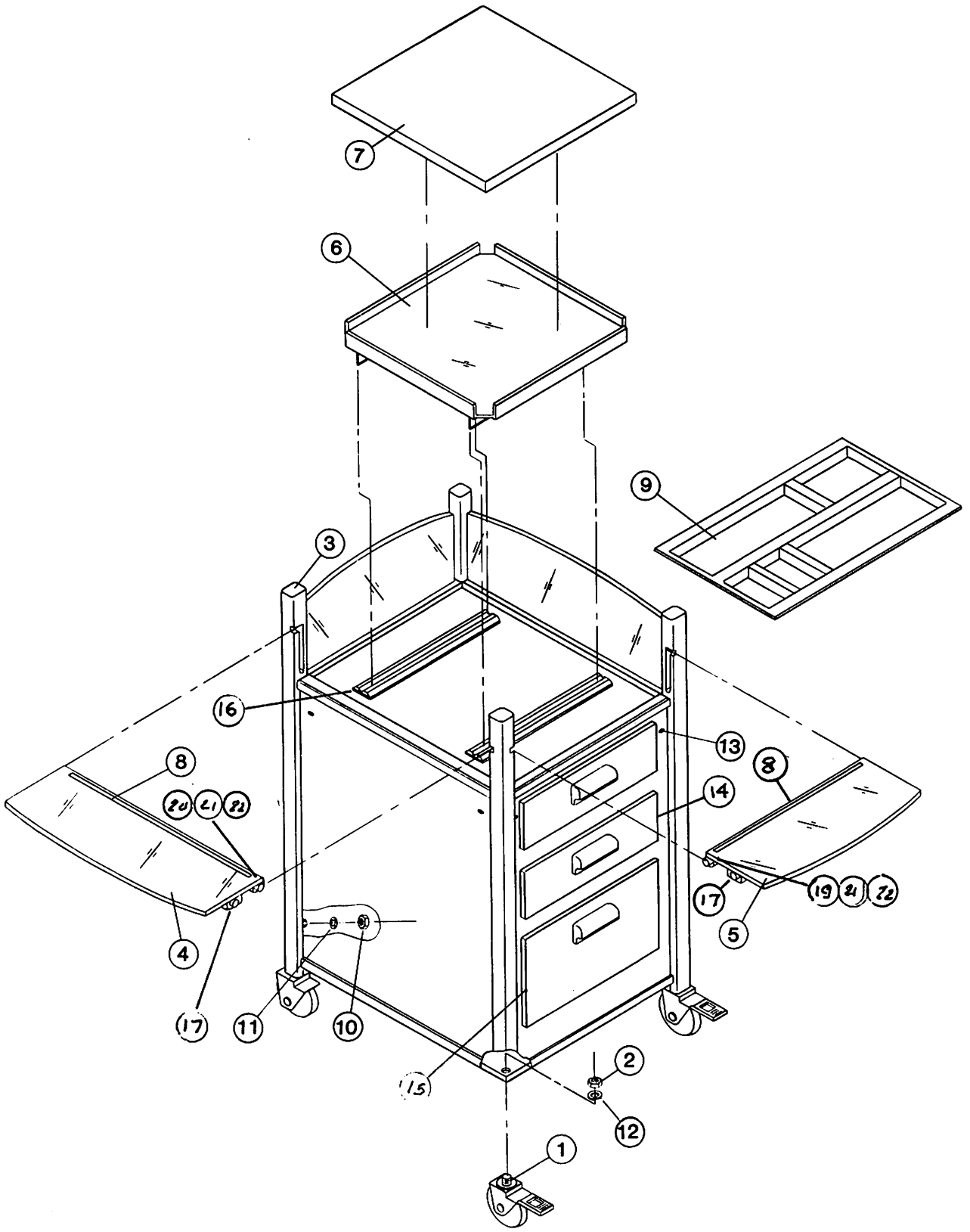

FIGURE 6.2 BASSINET/CART, PARTS LOCATION DIAGRAM

TABLE 6.2 CART ASSEMBLY, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
		CART ASSEMBLY	
		English	78 292 80
		Spanish	78 292 81
		French	78 292 82
		German	78 292 83
1		CASTER, WITH BRAKE	78 288 32
		CASTER, WITHOUT BRAKE	78 288 33
2		NUT, 1/2-13	99 113 02
3		POST, CORNER	78 292 16
4		PANEL, SIDE (Includes Item 8)	
		English	78 293 70
		Spanish	78 293 71
		French	78 293 72
		German	78 293 73
5		PANEL, END (Includes Item 8)	
		English	78 293 75
		Spanish	78 293 76
		French	78 293 77
		German	78 293 78
6		MATTRESS TRAY	78 293 80
7		MATTRESS	78 293 35
8		LABEL, WARNING (End and Side Panel)	
		English	78 162 56
		Spanish	78 162 57
		French	78 162 58
		German	78 162 59
9		DRAWER ORGANIZER	78 293 40
10		NUT, 1/4-20, LOCK NUT	99 109 41
11		FLATWASHER, 1/4"	99 125 23
12		WASHER, 1/2 LK	99 127 75
13		BUMPER	78 293 10
14		SMALL DRAWER REPLACEMENT KIT	78 931 78
15		LARGE DRAWER REPLACEMENT KIT	78 931 79
16		MATTRESS RAIL	78 292 14
17		PIVOT BLOCK REPLACEMENT KIT	78 931 87
18		DRAWER SLIDE REPLACEMENT KIT	78 931 80
19		RAIL END PANEL	78 293 06
20		RAIL SIDE PANEL	78 293 05
21		PIVOT PIN	78 293 16
22		PIVOT SPRING	99 141 55

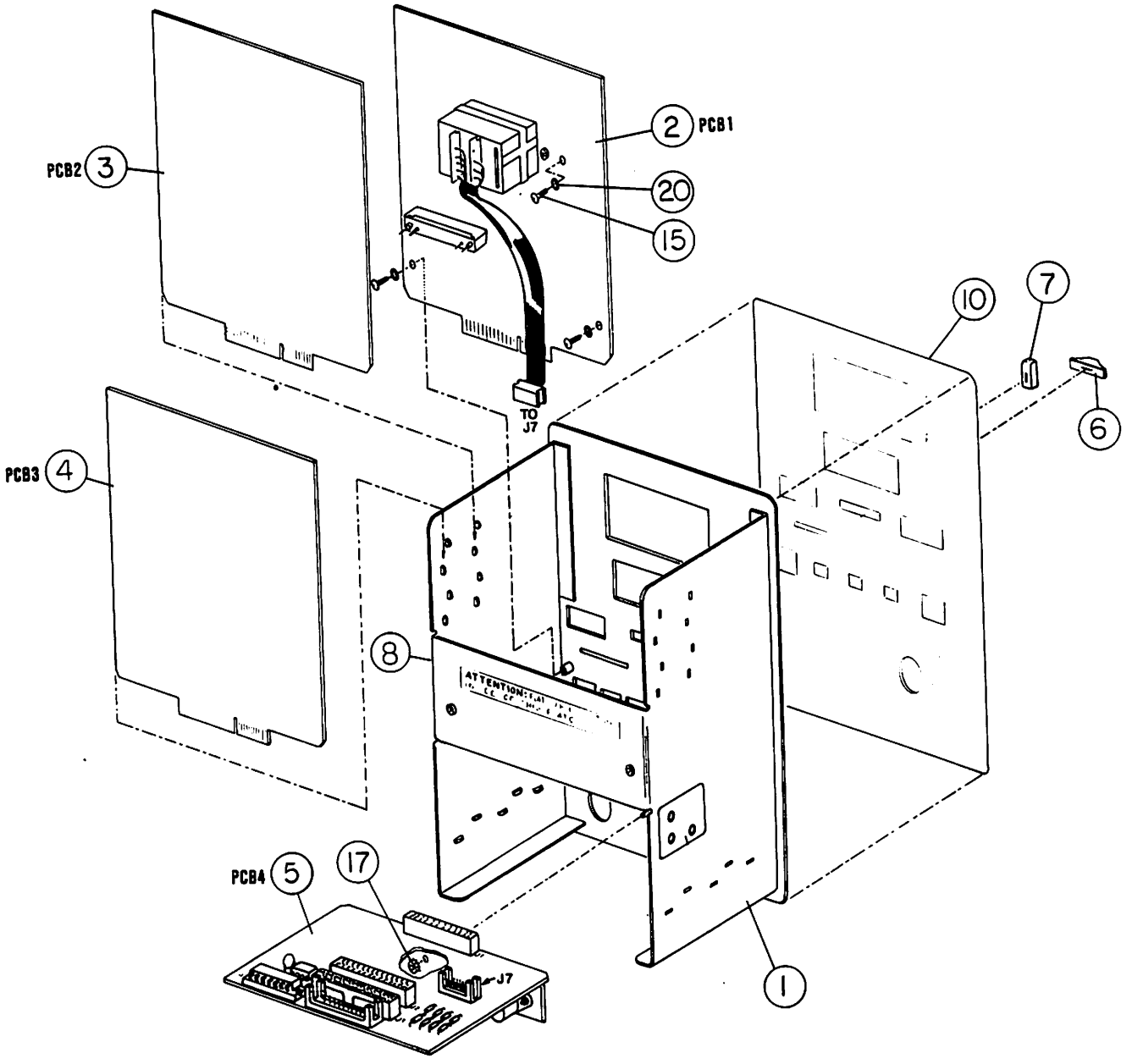

FIGURE 6.3 CONTROLLER ASSEMBLY, PARTS LOCATION DIAGRAM

TABLE 6.3 CONTROLLER ASSEMBLY, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		CONTROLLER ASSEMBLY:	
		LABELING	
		English	78 304 70
		Spanish	38 304 71
		French	38 304 72
		German	38 304 73
1		CHASSIS, CONTROLLER (Includes Items 2 through 12)	78 304 20
2		PCB1 ASSY, DISPLAY (Refer to Table 6.4)	78 315 70
3		PCB2 ASSY, MEASUREMENT/DGTL (Refer to Table 6.5)	78 316 70
4		PCB3 ASSY, CONTROL (Refer to Table 6.6)	78 317 70
5		PCB4 ASSY, MOTHERBOARD	
		CMB78-1 Series 00 (Ref. to Table 6.7)	78 318 70
		CMB78-1 Series 01 (Ref. to Table 6.7)	78 318 71
		CMB78-1 Series 02 (Ref. to Table 6.18)	78 318 72
6		BUTTON, SLIDE SWITCH, TOPPING	17 732 30
7		KNOB, CONTROL, SLIDE, SINGLE	89 100 30
8		TAG, DATA	78 155 57
9		LABEL, POT ADJUSTMENT	78 305 17
10		NAMEPLATE, FRONT PANEL, CONTROLLER (Includes Item 12)	
		English	78 304 05
		Spanish	78 304 06
		French	78 304 07
		German	78 304 08
11		LABEL, ATTN, CABLE	78 305 25
12		CRICKET SWITCH (Included with Items 1 and 10)	
13		NOT USED	
14		NOT USED	
15		SCR, 4-40 x 3/8 LG, TR PH SS	99 011 07
16		NOT USED	
17		NUT, 4-40, HX, "KEPS" S CAD PL	99 103 33
18		NOT USED	
19		NOT USED	
20		WSHR, NO. 4, LK SP SS	99 121 36

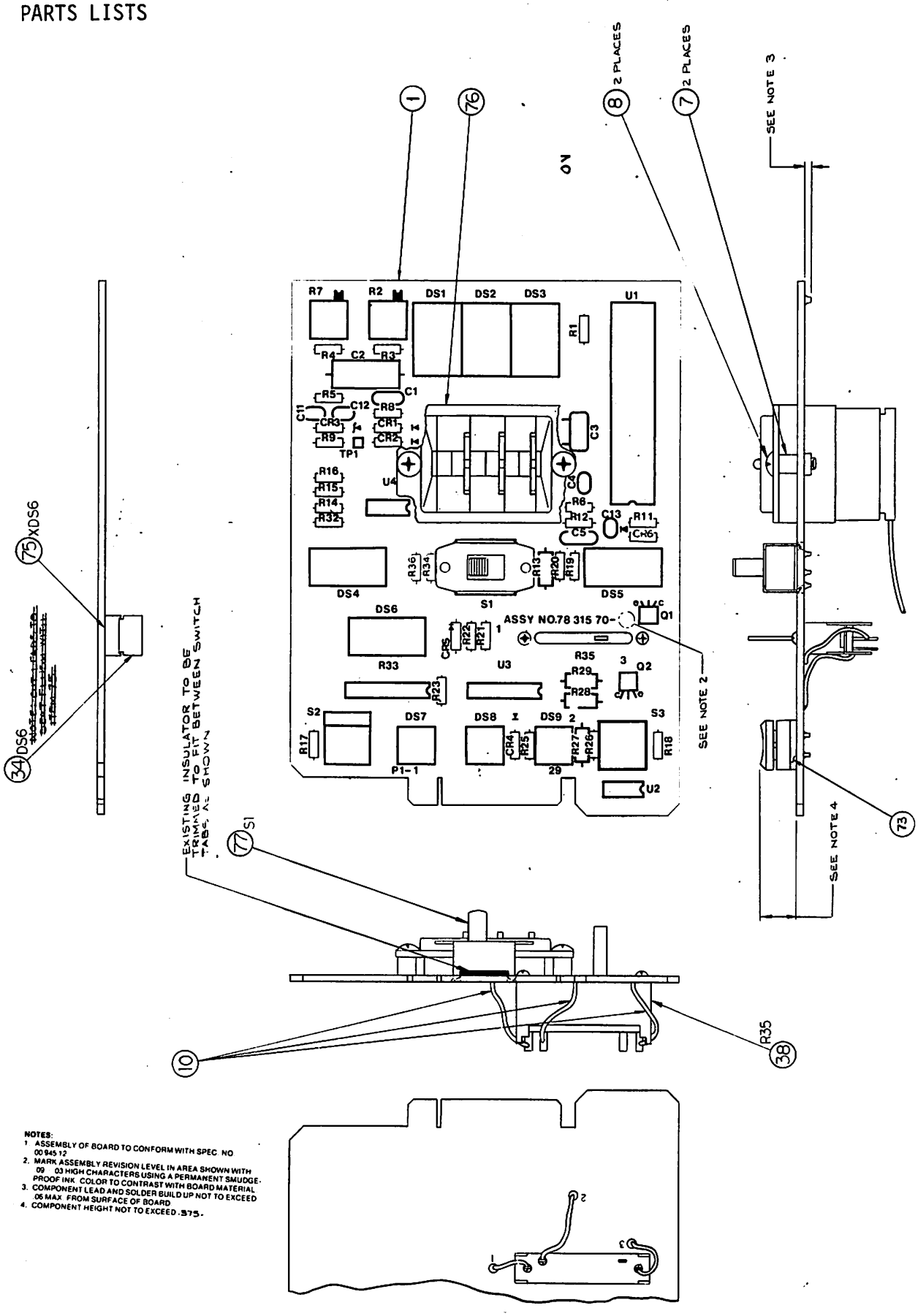

FIGURE 6.4 CONTROLLER DISPLAY BOARD PCB1, PARTS LOCATION DIAGRAM

TABLE 6.4 CONTROLLER DISPLAY BOARD PCB1, PARTS LIST
(Sheet 1 of 3)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		CONTROLLER DISPLAY BOARD PCB1	78 315 70
1		NOT USED	
2		NOT USED	
3		NOT USED	
4		NOT USED	
5		NOT USED	
6		NOT USED	
7		SPACER, .115 I.D. x 3/16 O.D. x 3/16 LG, NL	99 121 62
8		SCR, 4-40 x 7/16 LG, TR PH SS	99 011 35
9		NUT, PEM, 4-40, KF2-440 S CA	99 103 34
10		NOT USED	
11	C11-13	CAP, .001 MFD, 10%, 50V	17 BF 377
12	C1	CAP, .047 MFD, 10%, 50V	17 BF 257
13	C3,5	CAP, .10 MFD, 20%, 50V	17 430 57
14	C2	CAP, .22 MFD, 5%, 100V	17 AY 085
15	C4	CAP, 100 PF, 10%, 50V	17 BF 365
16		NOT USED	
17		NOT USED	
18		NOT USED	
19		NOT USED	
20	CR2,4,5	DIODE, 1N914	17 AR 500
21	CR3	DIODE, ZENER, 1N752A, 5.6V	17 502 60
22	CR1,6	DIODE, 1N34A	17 500 20
23		NOT USED	
24	DS1-3	DISPLAY, LED, ORN	17 BE 247
25		NOT USED	
26	U1	I.C., CMOS, 7107 A/D CONV	17 630 75
27	U2	I.C., CMOS, 3632 PERF DRIVER	17 630 04
28	U3	I.C., LOW POWER, 324 QUAD OP AMP	17 631 45
29	U4	I.C., 8 PIN, 1458 DUAL OP AMP	17 629 36
30		NOT USED	
31		NOT USED	

TABLE 6.4 CONTROLLER DISPLAY BOARD PCB1, PARTS LIST
(Sheet 2 of 3)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
32	DS7,8,9	LAMP, LED, RED	17 BE 258
33	DS4,5	LAMP, LED, GRN	17 BE 240
34	DS6	LAMP, LED, YELLOW, MODIFIED	78 315 30
35		NOT USED	
36		NOT USED	
37	R2, 7	RES, VAR, 500Ω, .5W, HORIZ ADJ	17 AN 115
38	R35	RES, VAR, SLIDE, 5.0K, .1W	17 530 52
39	R33	RES, NETWORK, DIP, 390Ω, 2%, 1.75W	17 AU 560
40		NOT USED	
41	R17	RES, 4.30K, .1%, 1/8W	17 AG 983
42		NOT USED	
43		NOT USED	
44	R3	RES, 1.50K, 1%, 1/8W	17 AF 209
45	R23	RES, 3.09K, 1%, 1/8W	17 AF 239
46	R12	RES, 10.0K, 1%, 1/8W	17 AF 288
47	R11	RES, 15.0K, 1%, 1/8W	17 AF 305
48	R4, 9	RES, 20.0K, 1%, 1/8W	17 AF 317
49	R6	RES, 100K, 1%, 1/8W	17 AF 384
50	R5	RES, 475K, 1%, 1/8W	17 AF 449
51	R8	RES, 2.00K, 1%, 1/8W	17 AF 221
52		NOT USED	
53	R22	RES, 40.2K, 1%, 1/8W	17 AF 346
54		NOT USED	
55		NOT USED	
56		NOT USED	
57	R16	RES, 100Ω, 5%, 1/4W	17 AH 697
58	R1	RES, 220Ω, 5%, 1/4W	17 AH 713
59		NOT USED	
60	R25	RES, 6.8K, 5%, 1/4W	17 AH 785
61	R14,15,18	RES, 10K, 5%, 1/4W	17 AH 793
62	R26, 32	RES, 4.7K, 5%, 1/4W	17 AH 777
63		NOT USED	
64	R19	RES, 3.9K, 5%, 1/4W	17 AH 773
65	R20	RES, 12K, 5%, 1/4W	17 AH 797

TABLE 6.4 CONTROLLER DISPLAY BOARD PCB1, PARTS LIST
(Sheet 3 of 3)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
66	R36	RES, 1.87K, 1%, 1/8W	17 AF 218
67	R34	RES, 2.67K, 1%, 1/8W	17 AF 233
68	R21	RES, 130K, .1%, 1/8W	17 AN 303
69	R13	RES, 47Ω, 5%, 1/2W	17 AB 121
70	R27	RES, 120Ω. 5%, 1/2W	17 AB 151
71	R28,29	RES, 240Ω, 5%, 1/2W	17 AB 172
72		NOT USED	
73		NOT USED	
74	XDS1,2,3	SOCKET, I.C. 14 DIP	17 AP 096
75	XDS6	SOCKET, I.C. 16 DIP	17 AP 097
76	S4	THUMBWHEEL SWITCH ASSEMBLY	17 682 50
77	S1	SWITCH SLIDE, 3PDT	17 682 54
78	S2,3	SWITCH, PB, SPDT (See Note 1)	17 682 55
79	Q1	TRANSISTOR, 2N4126, PNP	17 625 57
80	Q2	TRANSISTOR, 2N4124, NPN	17 625 58
81	S3	SWITCH, PB, SPDT (See Note 2)	17 682 64
82		SPACER, SWITCH (See Note 2)	78 315 31

NOTE 1. Item 78 is used for replacement of switch S3 (SILENCE/RESET) on PCB1 assemblies 78 315 70-1 through -4 only; not interchangeable with item 81.

NOTE 2. Items 81 and 82 are used for replacement of switch S3 (SILENCE/RESET) on PCB1 assemblies 78 315 70-5 and above; not interchangeable with item 78.

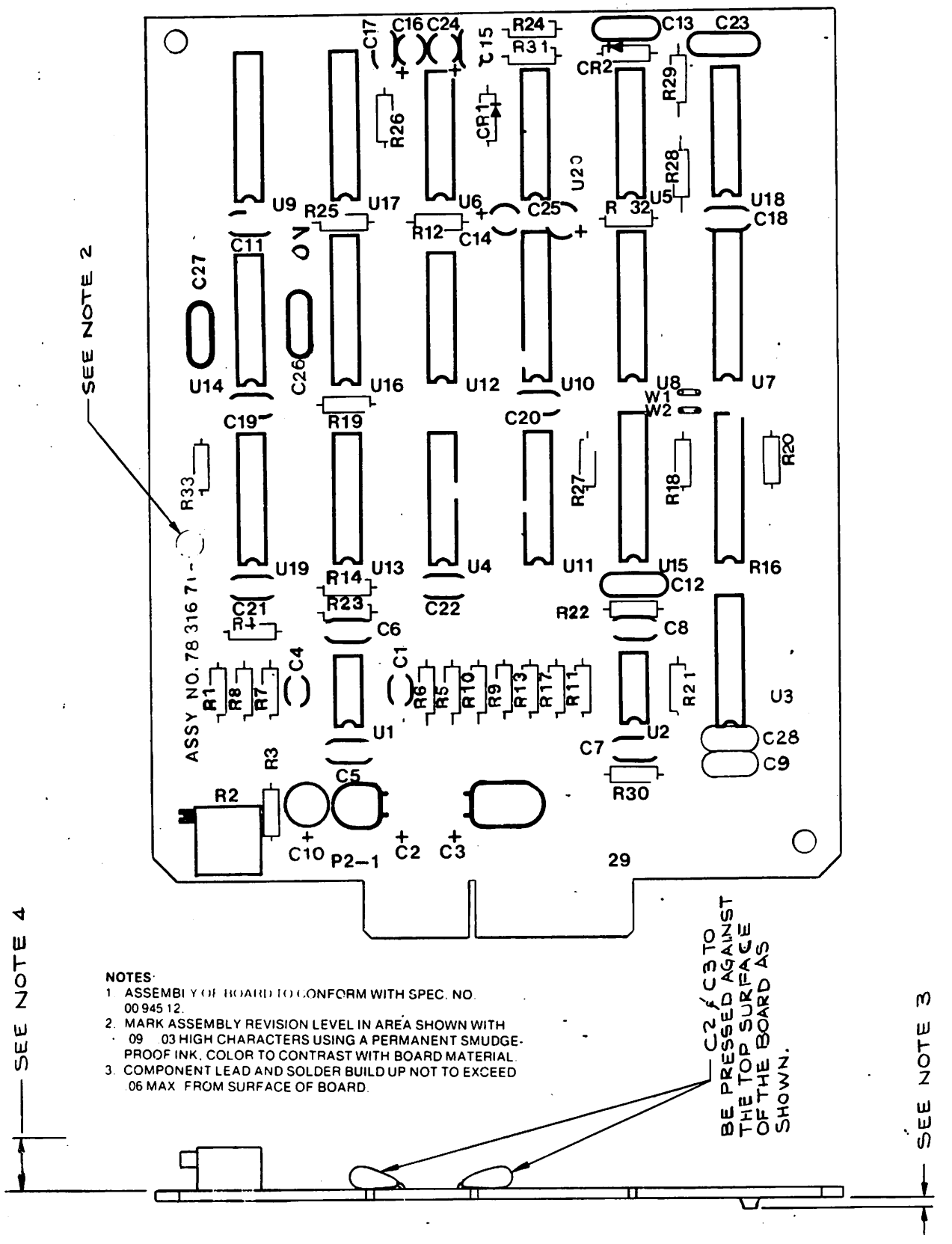
SEE NOTE 2
SEE NOTE 4
SEE NOTE 3
ASSY NO. 78 316 71-
C2 & C3 TO BE PRESSED AGAINST THE TOP SURFACE OF THE BOARD AS SHOWN.
NOTES:
1. ASSEMBLY OF BOARD TO CONFORM WITH SPEC. NO. 00 945 12.
2. MARK ASSEMBLY REVISION LEVEL IN AREA SHOWN WITH .09 .03 HIGH CHARACTERS USING A PERMANENT SMUDGE-PROOF INK. COLOR TO CONTRAST WITH BOARD MATERIAL.
3. COMPONENT LEAD AND SOLDER BUILD UP NOT TO EXCEED .06 MAX FROM SURFACE OF BOARD.

FIGURE 6.5 CONTROLLER MEASUREMENT/DIGITAL BOARD PCB2 PARTS LOCATION DIAGRAM

TABLE 6.5 CONTROLLER MEASUREMENT/DIGITAL BOARD PCB2, PARTS LIST (Sheet 1 of 3)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		CONTROLLER MEASUREMENT/DIGITAL BOARD PCB2	78 316 72
1		NOT USED	
2		NOT USED	
3		NOT USED	
4		NOT USED	
5		NOT USED	
6		NOT USED	
7		NOT USED	
8		NOT USED	
9	C2,3	CAP, 2.2 MFD, ± 10%, 50V	17 AW 218
10	C10	CAP, 4.7 MFD, ± 10%, 35V	17 AW 224
11	C1,4	CAP, .001 MFD, ± 10%, 50V	17 BF 377
12	C2,3,10,	CAP, 4.7 MFD, ± 10%, 35V	17 AW 224
13	C5-9,11, 15,17-22, 28	CAP, .01 MFD, +80 -20%, 50V	17 BF 388
14	C12,13,23, 26,27,29,30	CAP, .10 MFD, ± 20%, 50V	17 430 57
15	C14,16	CAP, 1.0 MFD, ± 10%, 35V	17 AW 212
16	C24,25	CAP, 2.2 MFD, ± 20%, 25V	17 405 22
17		NOT USED	
18	CR1,2	DIODE, 1N914	17 AR 500
19		NOT USED	
20		NOT USED	
21	U1,2	I.C., 1458, DUAL OP AMP	17 629 36
22	U3	I.C., 3302, QUAD COMPARATOR	17 629 58
23	U4	I.C., CMOS, 4066, 4 x BILATERAL SW	17 630 76
24	U5	I.C., CMOS, 4069, HEX INVERTER	17 629 92
25	U6	I.C., CMOS, 556, DUAL TIMER	17 632 09

TABLE 6.5 CONTROLLER MEASUREMENT/DIGITAL BOARD PCB2, PARTS LIST (Sheet 2 of 3)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
26	U7,8,16	I.C., CMOS, 4027, DUAL JK FF	17 629 86
27	U9	I.C., CMOS, 4518, DUAL 4 BIT DEC COUNTER	17 631 62
28	U10,17	I.C., CMOS, 4040, BINARY COUNTER	17 629 89
29	U11	I.C., CMOS, 4075, 3 x 3 INPUT OR	17 631 78
30	U12	I.C., CMOS, 4071, 4 x 2 INPUT OR	17 630 34
31	U13	I.C., CMOS, 4081, 4 x 2 INPUT AND	17 630 02
32	U14,19,20	I.C., CMOS, 4001, 4 x 2 INPUT NOR	17 629 75
33	U15	I.C., CMOS, 4022B, JOHNSON COUNTER	17 632 11
34	U18	I.C., CMOS, 4011, 4 x 2 INPUT NAND	17 629 77
35		NOT USED	
36		NOT USED	
37		NOT USED	
38	R28	RES, 47.5K, 1%, 1/8W FILM	17 AF 353
39	R1	NOT USED	
40	R2	RES, VAR, 2.0K, .5W, PCB, HRZ ADJ	17 AN 121
41	R3	RES, 4.12K, 1%, 1/8W FILM	17 AF 251
42	R9, 11,17,21, 22,25,33	RES, 10.0K, 1%, 1/8W FILM	17 AF 288
43	R30	RES, 31.6K, 1%, 1/8W FILM	17 AF 336
44	R7,8	RES, 2.0K, 1%, 1/8W FILM	17 AF 221
45	R10	RES, 4.02K, 1%, 1/8W FILM	17 AF 250
46	R12,18,24, 27	RES, 1.0M, 1%, 1/8W FILM	17 AF 480
47	R13	RES, 100K, 1%, 18W FILM	17 AF 384
48	R14,19, 20,23	RES, 5.1K, 5%, 1/4W CARBON	17 AH 779
49	R16	RES, NTWK, 8 @ 10K, 2%, .25 W/R	17 AU 530
50	R26	RES, 715K, 1%, 1/8W FILM	17 AF 466

TABLE 6.5 CONTROLLER MEASUREMENT/DIGITAL BOARD PCB2, PARTS LIST
(Sheet 3 of 3)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
51	R29	RES, 200K, 1%, 1/8W FILM	17 AF 413
52	R31,32	RES, 1M, 5%, 1/4W CARBON	17 AH 889
53	R1	RES, 34.8K, 1%, 1/8W FILM	17 AF 340
54		NOT USED	
55	R4	RES, 35.7K, 1%, 1/8W FILM	17 AF 341
56	R5	RES, 10.7K, 1%, 1/8W FILM	17 AF 291
57	R6	RES, 69.8K, 1%, 1/8W FILM	17 AF 369

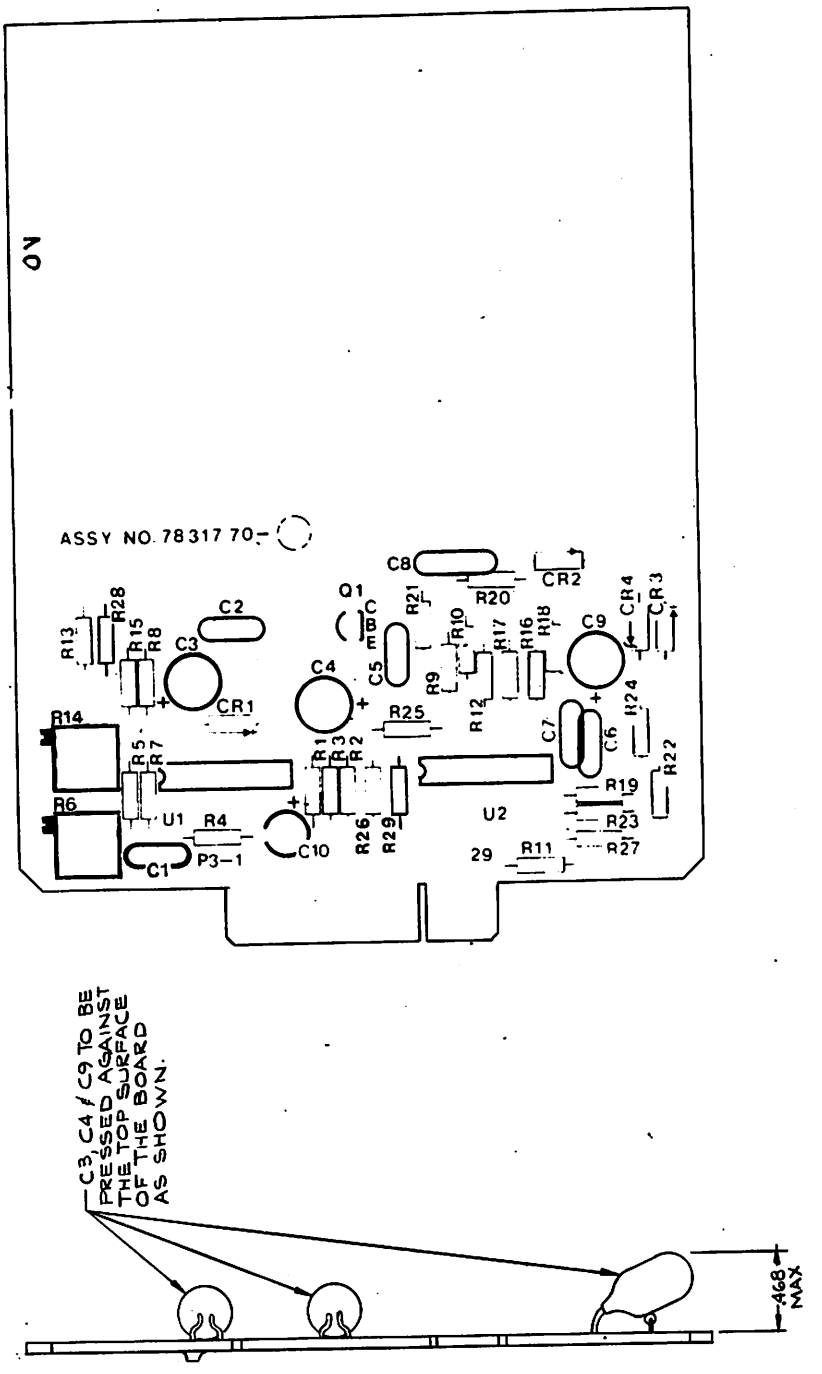

FIGURE 6.6 CONTROLLER CONTROL BOARD PCB3, PARTS LOCATION DIAGRAM

TABLE 6.6 CONTROLLER CONTROL BOARD PCB3, PARTS LIST
(Sheet 1 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		CONTROLLER CONTROL BOARD PCB3	78 317 70
1		NOT USED	
2		NOT USED	
3		NOT USED	
4		NOT USED	
5		NOT USED	
6		NOT USED	
7		NOT USED	
8		NOT USED	
9		NOT USED	
10		NOT USED	
11	C1,2,6,7	CAP, .01 MF, +80 -20%, 50V	17 BF 388
12	C3,4	CAP, 33 MF, 10%, 25V	17 AW 248
13	C5	CAP, .1 MF, 20%, 50V	17 430 57
14	C8	CAP, .22 MF, 20%, 50V	17 430 04
15	C9	CAP, 100 MF, 10%, 20V	17 AW 263
16	C10	CAP, 10 MFD, 10%, 25V	17 AW 236
17		NOT USED	
18		NOT USED	
19		NOT USED	
20		NOT USED	
21	CR1,2,3	Diode, 1N914	17 AR 500
22	CR4	Diode, 1N5231B	17 502 08
23		NOT USED	
24		NOT USED	
25		NOT USED	
26	U1,2	I.C., 3403	17 629 70
27		NOT USED	
28		NOT USED	
29		NOT USED	
30		NOT USED	

TABLE 6.6 CONTROLLER CONTROL BOARD PCB3, PARTS LIST
(Sheet 2 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
31	R28	RES, 3.01K, 1%, 1/8W	17 AF 238
32	R1,7,8, 10,15, 20,24	RES, 10K, 1%, 1/8W	17 AF 288
33	R2	RES, 15K, 1%, 1/8W	17 AF 305
34	R3	RES, 4.99K, 1%, 1/8W	17 AF 259
35	R4	RES, 8.06K, 1%, 1/8W	17 AF 279
36	R5	RES, 6.98K, 1%, 1/8W	17 AF 273
37	R6	POT, HORIZONTAL ADJ, 2K	17 AN 121
38	R9	RES, 1M, 1%, 1/8W	17 AF 480
39	R11	RES, 11.3K, 1%, 1/8W	17 AF 293
40	R12	RES, 22.6K, 1%, 1/8W	17 AF 322
41	R13	RES, 15.8K, 1%, 1/8W	17 AF 307
42	R14	POT, HORIZONTAL Adj., 10K	17 AN 127
43	R16	RES, 14.7K, 1%, 1/8W	17 AF 304
44	R17	RES, 30.1K, 1%, 1/8W	17 AF 334
45	R18	RES, 10.2K, 1%, 1/8W	17 AF 289
46	R21 29	RES, 90.9K, 1%, 1/8W	17 AF 380
47	R22	RES, 100Ω, 1%, 1/8W	17 AF 096
48	R23,27	RES, 100K, 1%, 1/8W	17 AF 384
49	R25	RES, 47.5K, 1%, 1/8W	17 AF 353
50	R26	RES, 2K, 1%, 1/8W	17 AF 221
51	R19	RES, 20K, 1%, 1/8W	17 AF 317
52		NOT USED	
53		NOT USED	
54		NOT USED	
55	Q1	TRANSISTOR, PNP, 2N4126	17 625 57

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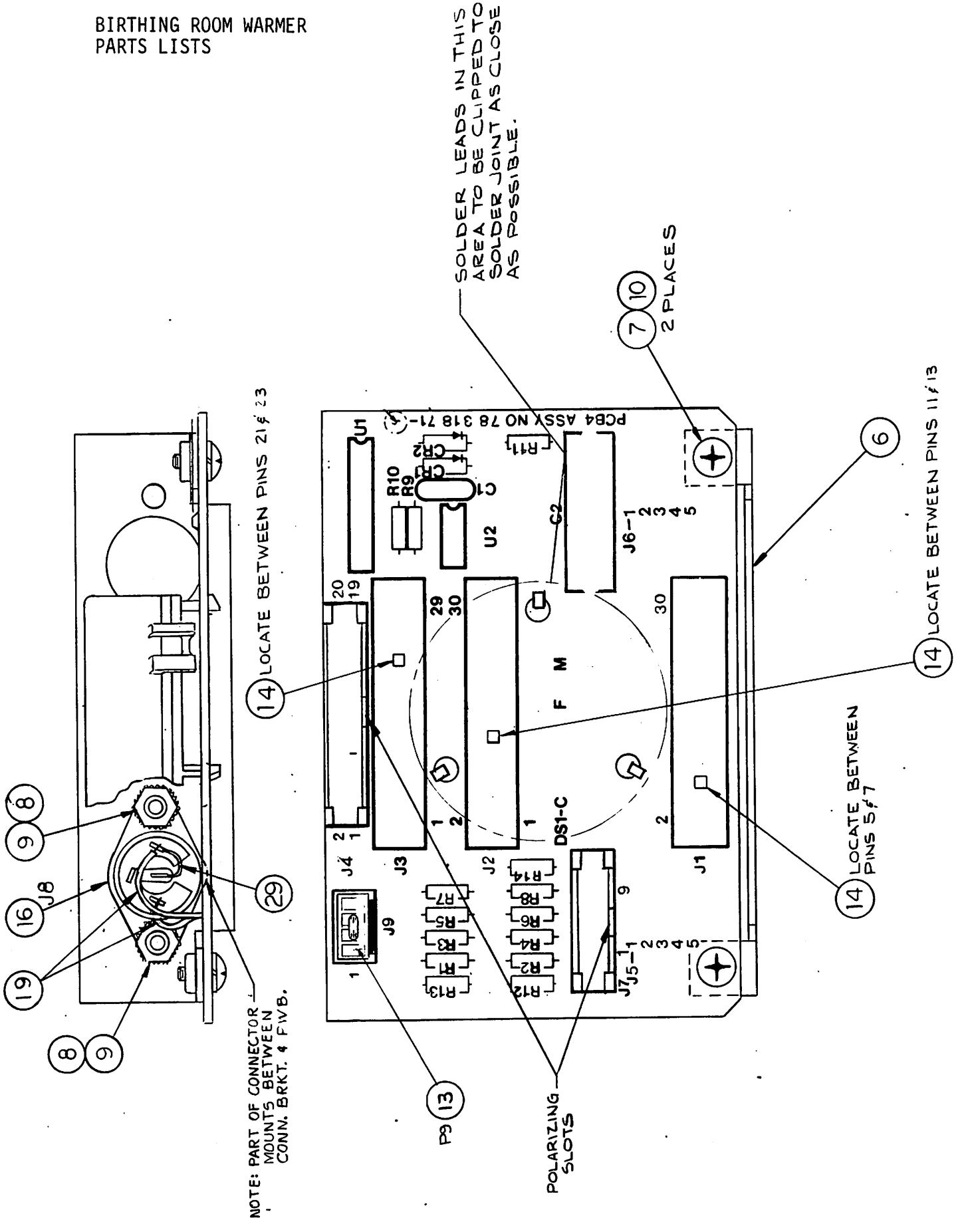

FIGURE 6.7 CONTROLLER MOTHER BOARD PCB4, PARTS LOCATION DIAGRAM

TABLE 6.7 CONTROLLER MOTHER BOARD PCB4, PARTS LIST
(Sheet 1 of 2)

ITEM NO.	REFERENCE DESIG.		DESCRIPTION	PART NUMBER
-			CONTROLLER MOTHER BOARD PCB4, CMB78-1 SERIES 00	78 318 70
-			CONTROLLER MOTHER BOARD PCB4, CMB78-1 SERIES 01	78 318 71
1			NOT USED	
2			NOT USED	
3			NOT USED	
4			NOT USED	
5			NOT USED	
6			BRACKET, CONNECTOR	78 318 25
7			SCR, 4-40 x 1/4, TR PH SS	99 010 56
8			WSHR, #4 LK SHE SS	99 121 37
9			NUT, NO. 4 HX SS SMALL PATTERN	99 103 35
10			WSHR, NO. 4 LK SP SS	99 121 36
11	C1		CAP, .001 MF, 20%, 1KV	17 BF 083
12		*	CONN, PCHDR, LKG, SGL ROW 4 POSN	17 BP 803
13		*	PLUG, ASSY, ALARM ENABLE	78 327 50
14			KEY, POLARIZING	17 BP 642
15	J1,2,3		CONN, RCPT, CARD EDGE, PC MTG	17 BP 632
16	J8		CONN, RCPT, FEMALE, 3 POSN	17 724 26
17	J4		CONN, RCPT, MALE, 20 CONTACTS	17 BP 653
18	J7		CONN, RCPT, MALE, 10 CONTACTS	17 732 34
19			NOT USED	
20			NOT USED	
21	CR1,2		DIODE, 1N913	17 AR 500
22			NOT USED	
23	U2	*	I.C., CMOS, 3634	17 630 11
24	U2		I.C., CMOS, 3633N	17 629 52
25	U1		I.C., CMOS, 4049	17 630 45
26	R12	*	RES, 69.8K, 1%, 1/8W FILM	17 AF 369
27			NOT USED	
			* PCB4 - 78 318 71 ONLY.	

TABLE 6.7 CONTROLLER MOTHER BOARD PCB4, PARTS LIST
(Sheet 2 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
28	DS1	TRANSDUCER, TONE, REPLACEMENT KIT	68 903 88
29		NOT USED	
30	R1	RES, 2K, 1%, 1/8W FILM	17 AF 221
31	R2, R13 *	RES, 20K, 1%, 1/8W, FILM	17 AF 317
32	R3	RES, 10K, 1%, 1/8W FILM	17 AF 288
33	R4	RES, 4.99K, 1%, 1/8W FILM	17 AF 259
34	R5	RES, 200K, 1%, 1/8W FILM	17 AF 413
35	R6	RES, 100K, 1%, 1/8W FILM	17 AF 384
36	R7	RES, 49.9K, 1%, 1/8W FILM	17 AF 355
37	R8	RES, 24.9K, 1%, 1/8W FILM	17 AF 326
38	R9	RES, 3.9M, 5%, 1/4W CARBON	17 AA 475
39	R10	RES, 100K, 5%, 1/4W CARBON	17 AA 361
40	R11	RES, 68Ω, 5%, 1/4W CARBON FILM	17 AH 689

* R13 - PCB4 - 78 318 71 ONLY.

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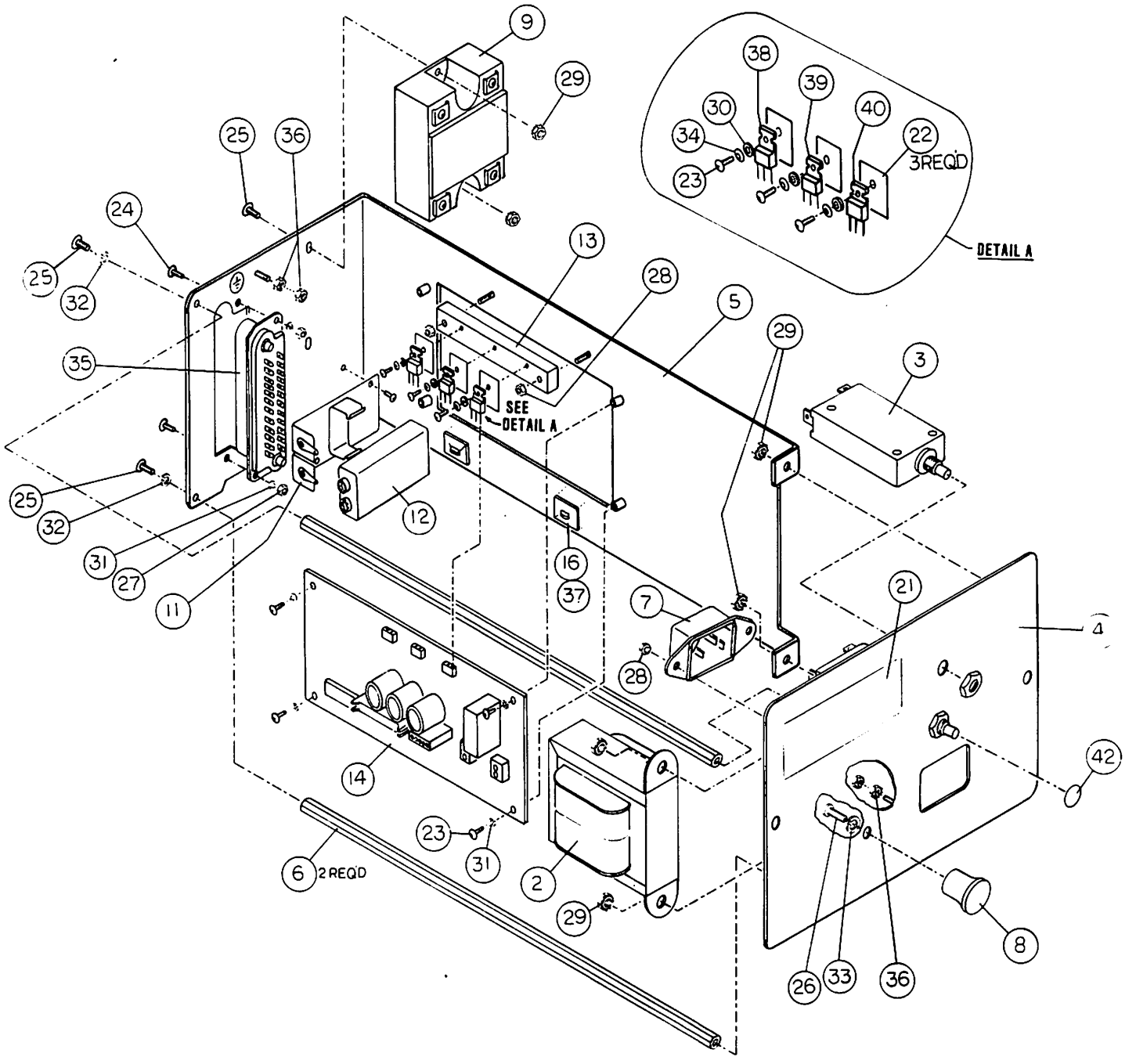

280 Vac LINE FILTER NOT SHOWN.

FIGURE 6.8 POWER MODULE ASSEMBLY, PARTS LOCATION DIAGRAM

TABLE 6.8 POWER MODULE ASSEMBLY, PARTS LIST
(Sheet 1 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		POWER MODULE ASSEMBLY:	
		LABELING, 110/120V	
		(English)	78 306 70
		(Spanish)	78 306 71
		(French)	78 306 72
		LABELING, 220/240V	
		(English)	78 306 80
		(Spanish)	78 306 81
		(French)	78 306 82
		(German)	78 306 83
		LABELING, ENGLISH (100V)	78 306 90
-		CHASSIS ASSEMBLY	
		(110/120V)	78 306 20
		(220/240V)	78 306 21
		(100V)	78 306 22
1		NOT USED	
2	T1	TRANSFORMER ASSEMBLY	
		(110/120V)	78 307 70
	T1	(220/240V)	78 307 80
	T1	(100V)	78 307 90
3	CB1	CIRCUIT BREAKER, 13A 110/120V	17 BH 156
	CB1,CB2	CIRCUIT BREAKER, 7A 220/240V	17 BH 152
4		PLATE, END, PWR CHASSIS	78 306 17
5		CHASSIS, POWER	78 306 18
6		SPACER, POWER CHASSIS	78 306 16
7		POWER CONNECTOR ASSEMBLY	78 306 65
8		KNOB, PLASTIC, BLACK, 1/4-20 THD	78 155 43
9	K2	RELAY, SOLID STATE, 240V, 10A (100V and 110/120V POWER MODULES)	68 903 83
	K2	RELAY, SOLID STATE, 240V, 10A (VDE) (220/240V POWER MODULES)	68 903 84
10		NOT USED	
11		BATTERY HOLDER ASSEMBLY	78 306 60
12		BATTERY 7.5V, RECHARGEABLE	17 807 65
13		HEATSINK, POWER CH, VOLT REGULATOR	78 306 19

TABLE 6.8 POWER MODULE ASSEMBLY, PARTS LIST
(Sheet 2 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
14		PCB 1 ASSY, POWER SUPPLY, SERIES 01	78 320 71
		POWER MODULE, (Refer to Table 6.9)	
15		NOT USED	
16		CLIP, CORD, RETAINING	17 061 87
17		NOT USED	
18		NOT USED	
19		NOT USED	
20		NOT USED	
21		TAG, DATA	78 306 40
		TAG, DATA, IEC 601-1	78 306 47
22		INSULATOR, XSTR, THERM COND	17 061 19
23		SCREW, 4-40 x 1/4 TR PH SS	99 010 56
24		SCREW, 4-40 x 3/8 TR PH SS	99 011 07
25		SCREW, 8-32 x 3/8 TR PH SS	99 031 38
26		SCREW, 1/4-20 x 3/8 TR PH SS	99 055 03
27		NUT, 4-40 HX SS	99 103 00
28		NUT, 4-40 HX KEPS S CA	99 103 33
29		NUT, 8-32 HX KEPS S CA	99 106 32
30		WSHR, SHOULDER, NYL	99 121 52
31		WSHR, NO. 4 LK SP SS	99 121 36
32		WSHR, NO. 8 LK SP SS	99 122 95
33		WSHR, 1/4 LK SP SS	99 125 53
34		WSHR, COMPRESSION	99 121 66
35		CONNECTOR, RECPT, FEM, 24 POSN	17 BP 644
36		NUT, 6-32 HX KEPS S CA	99 105 34
37		NOT USED	
38	VR1,2	REGULATOR, MODIFIED, POS 7.5W, 500 MA	78 306 45
39		NOT USED	
40	VR3	REGULATOR, MODIFIED, NEG, 7.5W, 500 MA	78 306 46
41		NOT USED	
42		BUTTON, PLUG, PLASTIC	78 306 31
43		FILTER, EM ± (280VAC)	17 585 47
44		FILTER, MOUNTING PLATE	78 306 13
45		MTG STRAP, ALTER MTG PLATE	78 306 14
46		SCREW, 8-32-5/8" TR PH SS	99 032 57
47		WSHR, PL #8, 3/4" O.D.	99 123 32
48		WIRING HARNESS, 230 VAC	78 992 96

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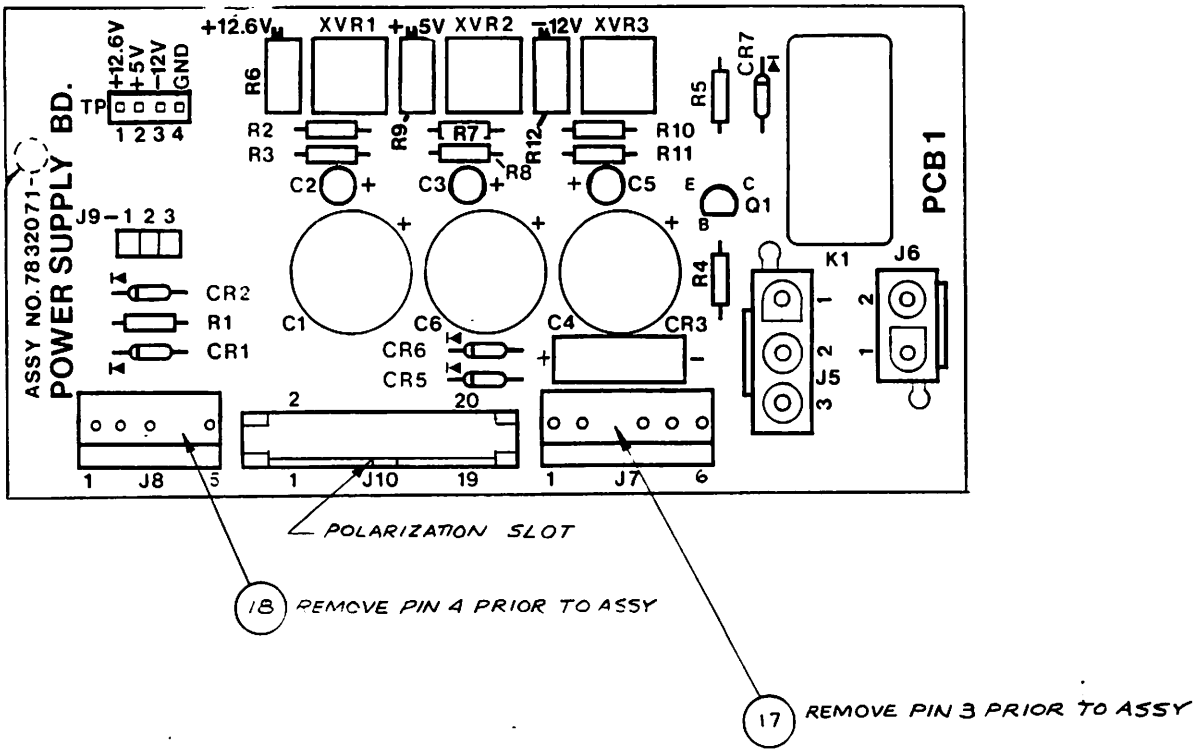

FIGURE 6.9 POWER MODULE POWER SUPPLY BOARD PCB1 PARTS LOCATION DIAGRAM

TABLE 6.9 POWER MODULE POWER SUPPLY BOARD, PCB1 (SERIES 01 POWER MODULE), PARTS LIST (Sheet 1 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		POWER MODULE POWER SUPPLY BOARD, PCB1	78 320 91
1		NOT USED	
2		NOT USED	
3		NOT USED	
4		NOT USED	
5		NOT USED	
6		NOT USED	
7		NOT USED	
8		NOT USED	
9		NOT USED	
10	C1,4,6	CAP, 1000 MFD, 35V	17 AW 853
11	C2,3,5	CAP, 10 MFD, 25V	17 AW 236
12		NOT USED	
13		NOT USED	
14	J9	CONN, PC HEADER, SGL ROW, 3 POSN	17 BP 373
15	J6	CONN, RCPT, MALE, PC MTG, 2 POSN	17 BP 647
16	J5	CONN, RCPT, MALE, PC MTG, 3 POSN	17 BP 648
17	J7	CONN, RCPT, MALE, PC TERM, 6 POSN	17 BP 029
18	J8	CONN, RCPT, MALE, PC TERM, 5 POSN	17 BP 028
19	J10	CONN, PC HEADER, DBL ROW, 20 POSN	17 BP 653
20	XVR1-3	CONN, RCPT, FEMALE, PC TERM, 3 POSN	17 731 94
21	CR1,2	DIODE, 1N914	17 AR 500
22	CR3	RECTIFIER, BRIDGE, F.W., 1.5A, 100V	17 AS 201
23	CR5-7	DIODE, 1N4001	17 AS 000
24		NOT USED	
25	R2,7,10	RES, 124 Ω, 1%, 1/8W	17 AF 105
26	R8	RES, 274 Ω, 1%, 1/8W	17 AF 138
27	R11	RES, 976 Ω, 1%, 1/8W	17 AF 191
28	R3	RES, 1.02K, 1%, 1/8W	17 AF 293
29	R4	RES, 3.74K, 1%, 1/8W	17 AF 247
30	R1	RES, 8.66K, 1%, 1/8W	17 AF 282
31	R5	RES, 12.1K, 1%, 1/8W	17 AF 296
32		NOT USED	
33		NOT USED	
34	R6,9,12	RES, VARIABLE, 200Ω, 10%, 1/2W	17 AN 054
35		NOT USED	

TABLE 6.9 POWER MODULE POWER SUPPLY BOARD, PCB1 (SERIES 01 POWER MODULE), PARTS LIST (Sheet 2 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
36	K1	RELAY, SPDT, 12 VDC, 188Ω	17 652 66
37		NOT USED	
38	Q1	TRANSISTOR, 2N4126	17 625 57
39		NOT USED	
40	TP1-4	TERM, STRIP, BIFURCATED, 4 POSN	17 BG 013

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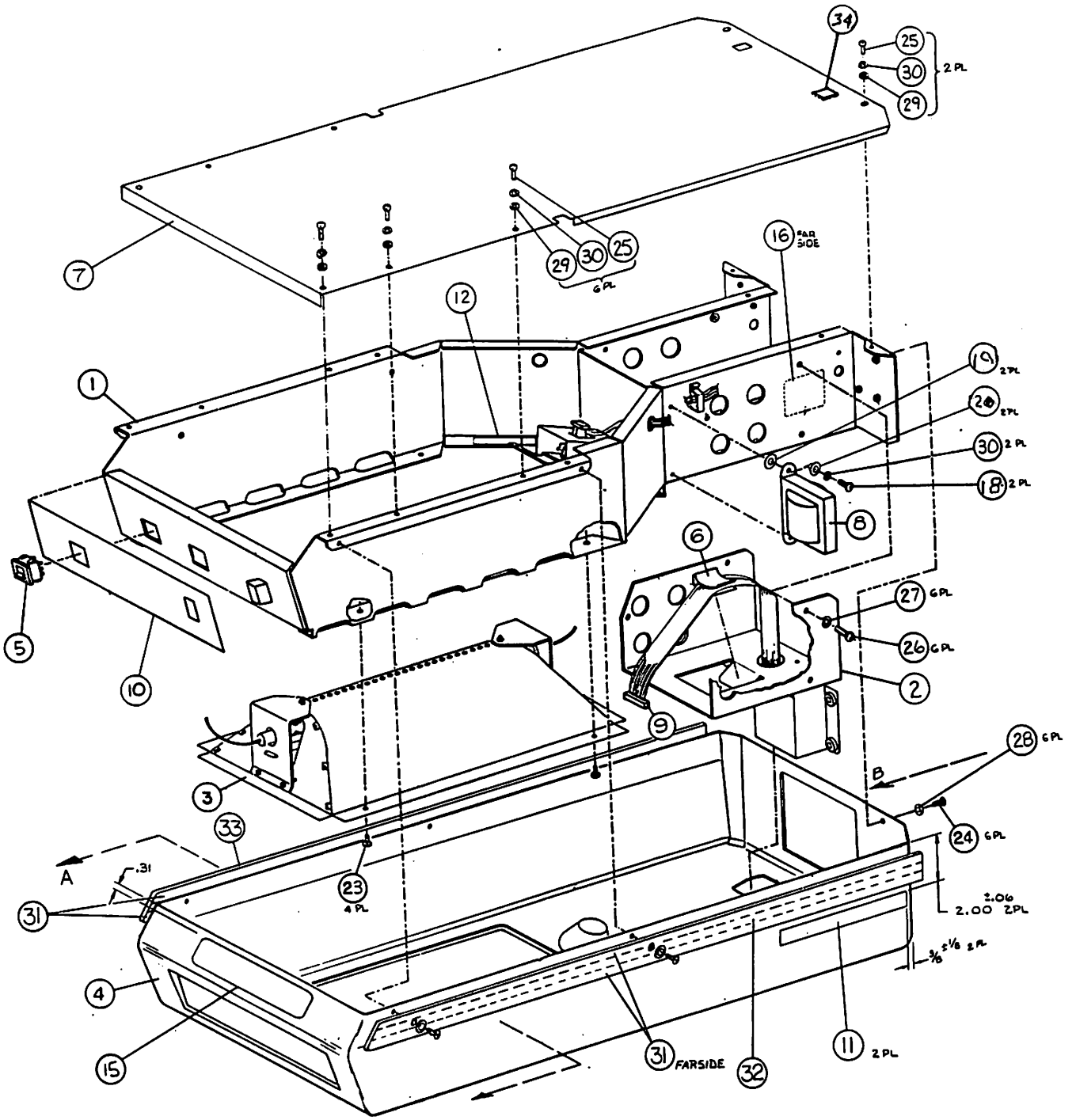

FIGURE 6.10 WARMER MODULE ASSEMBLY, PARTS LOCATION DIAGRAM

TABLE 6.10 WARMER MODULE ASSEMBLY, PARTS LIST
(Sheet 1 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		WARMER MODULE ASSEMBLY	
		(English, 115V)	78 291 70
		(Spanish, 115V)	78 291 71
		(French, 115V)	78 291 72
		(English, 230V)	78 291 80
		(Spanish, 230V)	78 291 81
		(French, 230V)	78 291 82
		(German, 230V)	78 291 83
		(English, 100V)	78 291 90
1		WARMER MODULE SUBASSEMBLY (Refer to Table 6.11)	78 286 20
2		BRACKET, MTG, WARMER MODULE	78 270 17
3		HEATER/REFLECTOR ASSEMBLY	
		(115V)	78 263 70
		(230V)	78 263 80
		(100V)	78 263 90
4		HOOD, WARMER (Includes Items 11, 13 and 15,31,32,33)	
		(English, 115V)	78 990 81
		(Spanish, 115V)	78 990 82
		(French, 115V)	78 990 83
		(English, 230V)	78 990 84
		(Spanish, 230V)	78 990 85
		(French, 230V)	78 990 86
		(German, 230V)	78 990 87
		(English, 100V)	78 990 88
5		SWITCH, ROCKER, 2 PST (S3)	17 682 63
6		CLAMP, FLAT CABLE, PLASTIC	17 062 11
7		SCREEN, TOP, WARMER	78 265 20
8		TRANSFORMER ASSEMBLY	
		(115V)	78 265 95
		(230V)	78 265 96
		(100V)	78 265 97
9		INTERCONNECT CABLE ASSY	67 100 18
10		LABEL, SWITCH PANEL	
		English	78 291 15
		Spanish	78 291 16
		French	78 291 17
		German	78 291 18

TABLE 6.10 WARMER MODULE ASSEMBLY, PARTS LIST
(Sheet 2 of 2)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
11		LABEL, EXPLOSION HAZARD	
		(English/French)	78 291 10
		(Spanish)	78 291 11
		(German)	78 291 12
12		LABEL, LAMP REPLACEMENT	
		(English)	78 265 50
		(Spanish)	78 265 51
		(French)	78 265 52
		(German)	78 265 53
13		LABEL, HEATER REPLACEMENT (English)	
		(115V) ENGLISH	78 291 00
		(115V) SPANISH	78 291 01
		(115V) FRENCH	78 291 02
		(230V) ENGLISH	78 291 50
		(230V) SPANISH	78 291 51
		(230V) FRENCH	78 291 52
		(230V) GERMAN	78 291 53
		(100V) ENGLISH	78 291 03
14		NOT USED	
15		LABEL, PRODUCT IDENT, BIRTHING ROOM WARMER	78 291 05
16		NOT USED	
17		NOT USED	
18		SCREW, 8-32 x 1/2, TR PH SS	99 031 99
19		WASHER, FL 0.172 ID x 0.500 OD, NYLON	99 122 65
20		WASHER, SHOULDER, 0.172 ID x 0.437 OD NYLON	99 123 38
21		NOT USED	
22		NOT USED	
23		SCREW, 6 - 32 x 5/16, TR PH, SS, NYLOCK	99 023 03
24		SCREW, 6 - 32 x 3/8, OV, PH, SS, NYLOCK	99 023 45
25		SCREW, 8 - 32 x 3/8, TR, PH, SS	99 031 38
26		SCREW, 1/4 - 20 x 3/8, RD, PH, SS	99 055 03
27		WASHER, LK, SP, 1/4, SS	99 125 53
28		WASHER, FINISHING, #6 NYLON	99 122 44
29		WASHER, FLAT, #8	99 122 62
30		WASHER, LK, SP #8 SS	99 122 95
31		TAPE ADHESIVE, TRANSFER (4, PIECES AT 33.75)	99 902 74
32		TRIM STRIP, RIGHT HAND SIDE	78 291 21
33		TRIM STRIP, LEFT HAND SIDE	78 291 22
34		CONTINUOUS GROMMET	89 186 07

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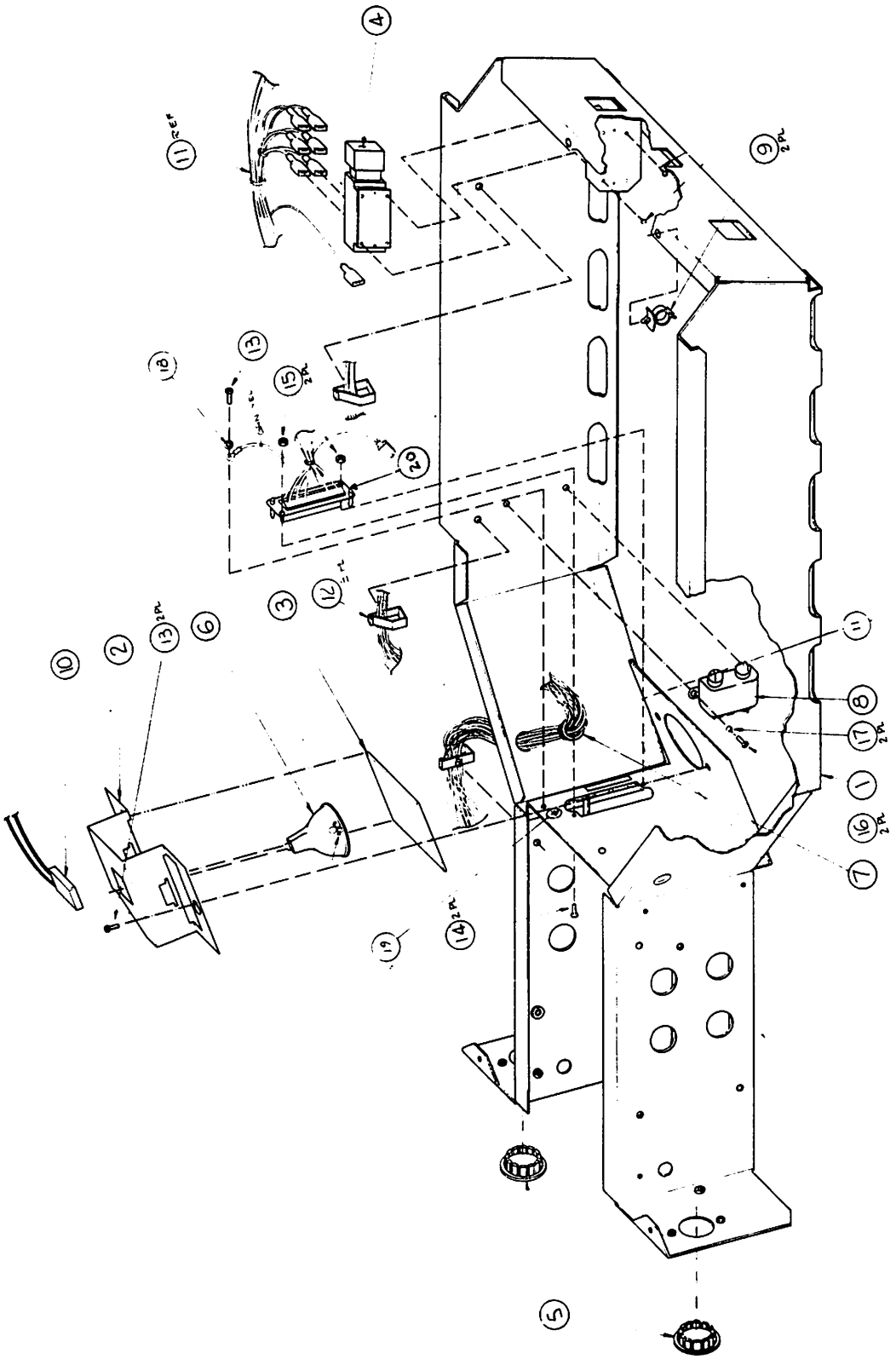


FIGURE 6.11 WARMER MODULE SUBASSEMBLY, PARTS LOCATION DIAGRAM

TABLE 6.11 WARMER MODULE SUBASSEMBLY, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		WARMER MODULE SUBASSEMBLY*	78 286 20
1		FRAME, MTG, WARMER*	78 260 01
2		BRACKET, LAMP MTG	78 260 25
3		WINDOW, GLASS, SQUARE	78 260 36
4		SWITCH, PB, 3P ST, 16A, 250 V	17 682 58
5		PLUG BUTTON 78 286 10	
6		LAMP, INCAND, 12 V, 50 W (EXN)	17 807 41
7		GROMMET, .79 ID, .88 MTG HOLE, PLASTIC	78 260 11
8		FILTER, LINE, 115 V/250 VAC	17 585 38
9		CLIP, PUSH-IN, .35 DIA, PLASTIC	78 260 30
10		CONNECTOR ASSY (Exam Light)	78 258 70
11		WIRING HARNESS ASSY	78 259 71
12		CLIP, WIRE BUNDLE	17 AZ 323
13		SCREW, 6 - 32 x 5/16, TR, PH, SS, NYLOCK	99 023 03
14		SCREW, 4 - 40 x 1/4, TR, PH, SS	99 010 56
15		NUT, HEX, 4 - 40, KEPS, S, CA	99 103 33
16		SCREW, 8 - 32 x 3/8, TR, PH, SS	99 031 38
17		WASHER, LK, SP, #8, SS	99 122 95
18		WASHER, #6, LK, SH1, SS	99 122 19
19		LABEL, GROUND	68 212 00
20		CONNECTOR	17 BP 661

* Also order Items 10 and 12 from pages 6-35 and 6-36

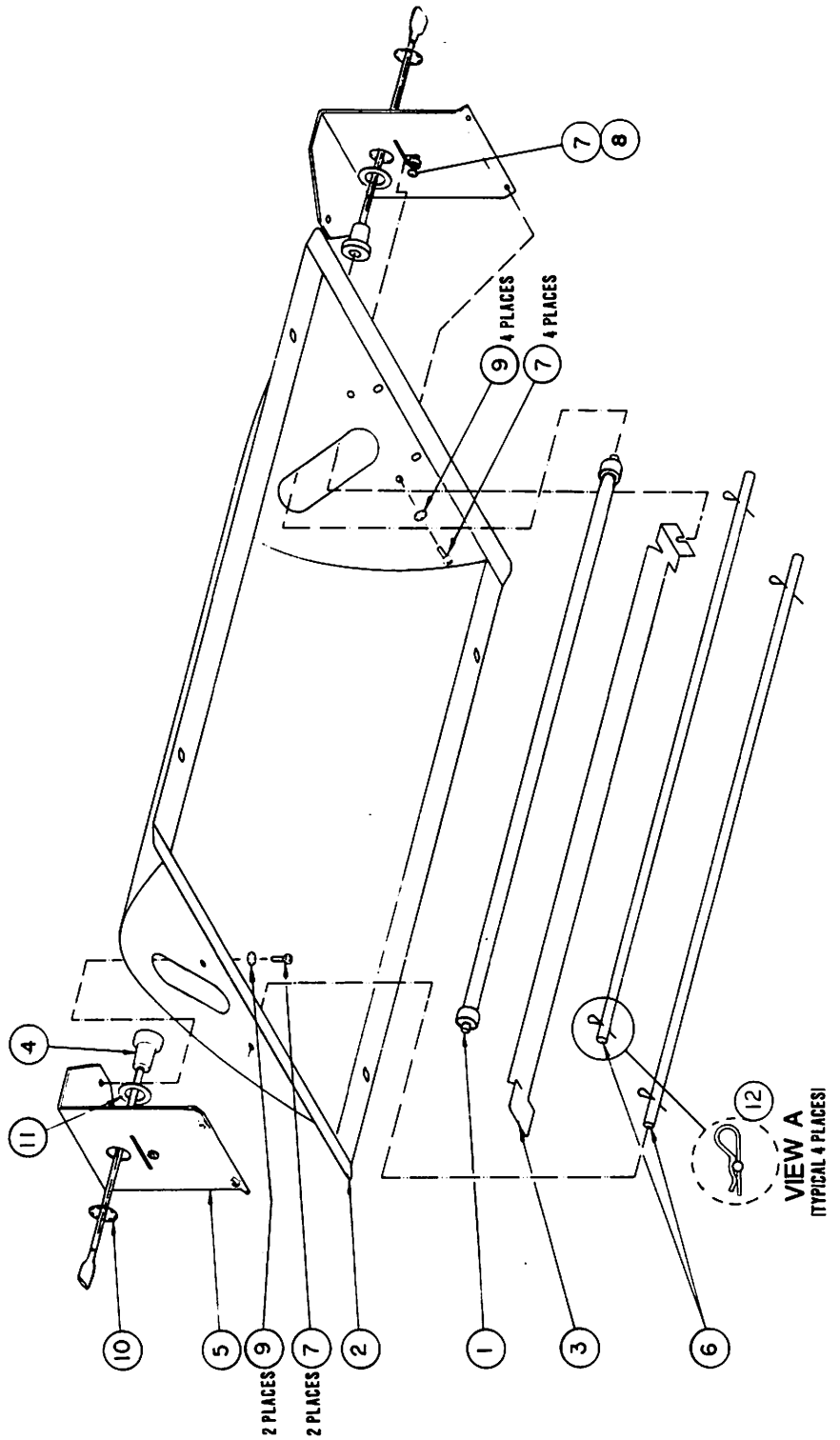


FIGURE 6.12 HEATER/REFLECTOR ASSEMBLY, PARTS LOCATION DIAGRAM

TABLE 6.12 HEATER/REFLECTOR ASSEMBLY, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		HEATER/REFLECTOR ASSEMBLY: (110/120V) 78 263 70 (220/240V) 78 263 80 (100V) 78 263 90	
1	HTR1	HEATING ELEMENT, 120V	78 263 00
	HTR1	HEATING ELEMENT, 240V	78 263 01
	HTR1	HEATING ELEMENT, 100V	78 263 02
2		REFLECTOR, PARABOLIC	78 263 20
3		REFLECTOR, CURVED (Replacement Kit)	78 930 81
4		HEATER CONNECTOR ASSY (Part Of Item 5)	
5		*BRACKET, SUPPORT, HEATER RETROFIT KIT	78 931 82
6		ROD, GUARD, HEATER (Replacement Kit)	78 930 82
7		SCREW, #6 - 32 x 1/4 LG TR PH SS	99 022 72
8		WASHER, #6 FL, SS	99 122 03
9		NOT USED	
10		RING, RTANG, EXT 0.525 DIA, PUSH-ON SS (Part of Item 5)	
11		WASHER, FL .578 ID x 1.06 OD x .06 THK (Part of Item 5)	
12		COTTER, INTL, HAIR PIN (Part of Item 6)	99 140 97
		* Includes Items 4, 5, 10 and 11	

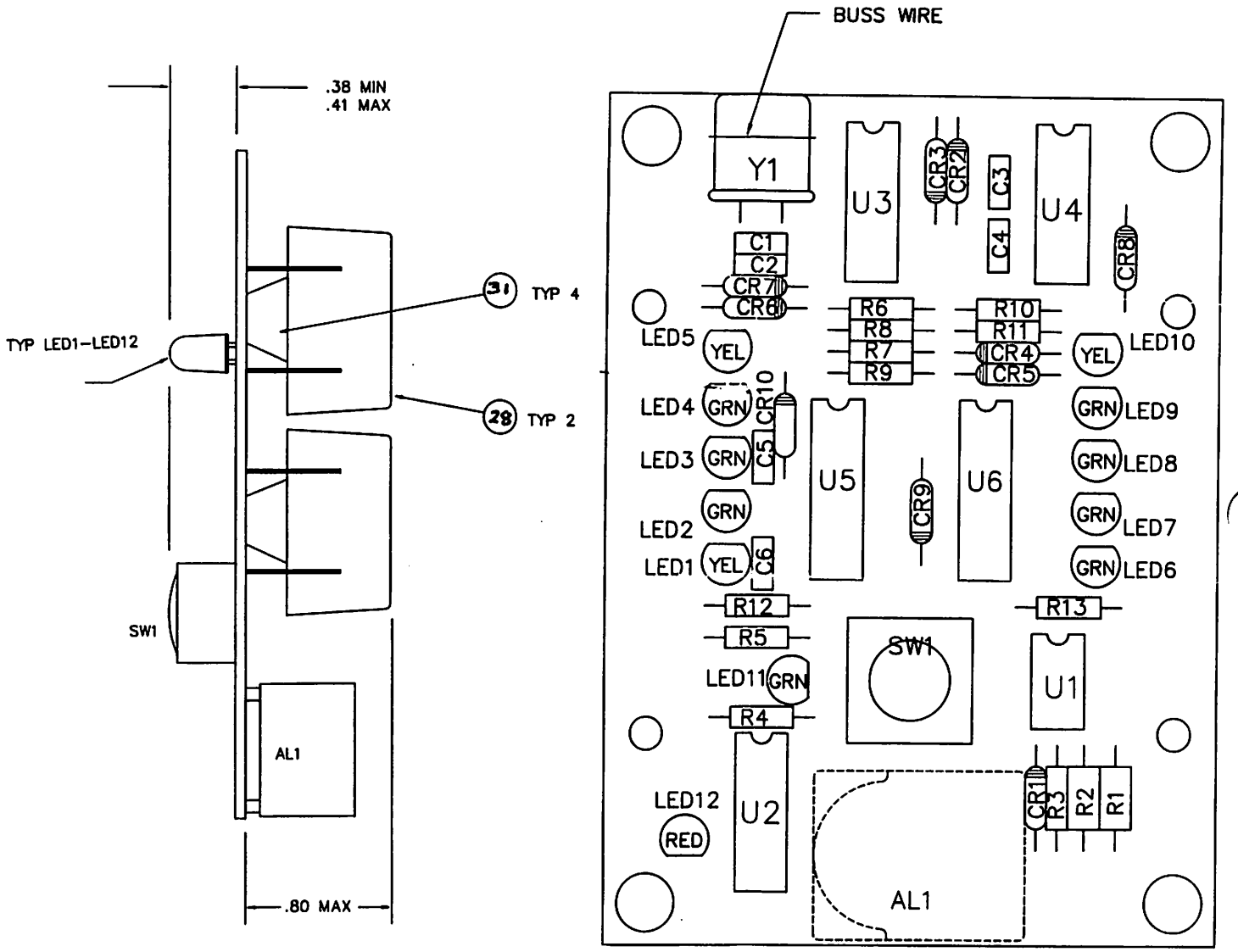


FIGURE 6.13 APGAR TIMER, PARTS LOCATION DIAGRAM

TABLE 6.13 APGAR TIMER, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		APGAR TIMER (ENGLISH)	78 290 25
1		ENCLOSURE	
		Blue	DA130BL
		Brown	DA130BN
2		MOUNTING BRACKET	DA10B1296
3		SCREW, SELF TAPPING # 4 x 1/4 LG	DA05C12972A6
4		WASHER, FLAT # 4	DA05C12972A7
5		SCREW, FLAT HD, 4-40 x 1/4 LG	99 010 63
6		NOT USED	
7		PRINTED CIRCUIT BOARD, ASSY	DA06C1290
8		NOT USED	
9	U1	LOW VOLT DETECTOR ICL7665 BPA	DAICL7665BPA
10	U2, U4	DUAL FLIP FLOP 74HC74	17 631 11
11	U3	CLOCK, IC M7213IPD	17 632 57
12	U5, U6	DUAL SHIFT REGISTER, CD 4D15B	DACD4015B
13	C1, C2	CAP, 22 pF CK05	DA15000032
14	C3	CAP, 0.1µF CK05	17 A& 646
15	C4, C5, C6	CAP, 0.01µF CK05	17 BF 210
16	R1, R10	RES, 78.7K, 1%, RN55	DARN55D
17	R3, R9-R11	RES, 1 MEG, 5%, 1/4W, RC07	17 AA 433
18	R4	RES, 1K, 5%, 1/4W, RC07	17 AA 217
19	R5-R8	RES, 100K, 5%, 1/4W, RC07	17 AA 361
20	R12	RES, 270Ω, 5%, 1/4W, RC07	17 AA 175
21	R13	RES, 430Ω, 5%, 1/4W, RC07	DA47000070
22	R2	RES, 30.1K, 1%, RN55D	17 AE 832
23	LED1,5,10	LED YELLOW HP HLMP3850	DAHLMP3850
24	LED2-4, 6-11	LED GREEN HP HLMP3950	DAHLMP3950
25	LED12	LED RED HP HLMP4700	DAHLMP4700
26	CR1-CR9	DIODE, 1N4148	17 AR 559
27	AL1	BUZZER, STAR, KMB-06	DAKMB06
28		BATTERY HOLDER, KYSTONE 2223	DABH4AAPC
29	SW1	SWITCH, LEDEX 3.14100.001	DA314100001
30	Y1	CRYSTAL, 4.194304 MHZ	17 524 08
31		RUBBER FOOT, SELF-STICK	DA2019000007
32		LABEL, FRONT PANEL	78 290 30
33		BATTERY, 1.5V SIZE AA	
34	R9	RES, 10 MEG, 5%, 1/4W	17 AA 505

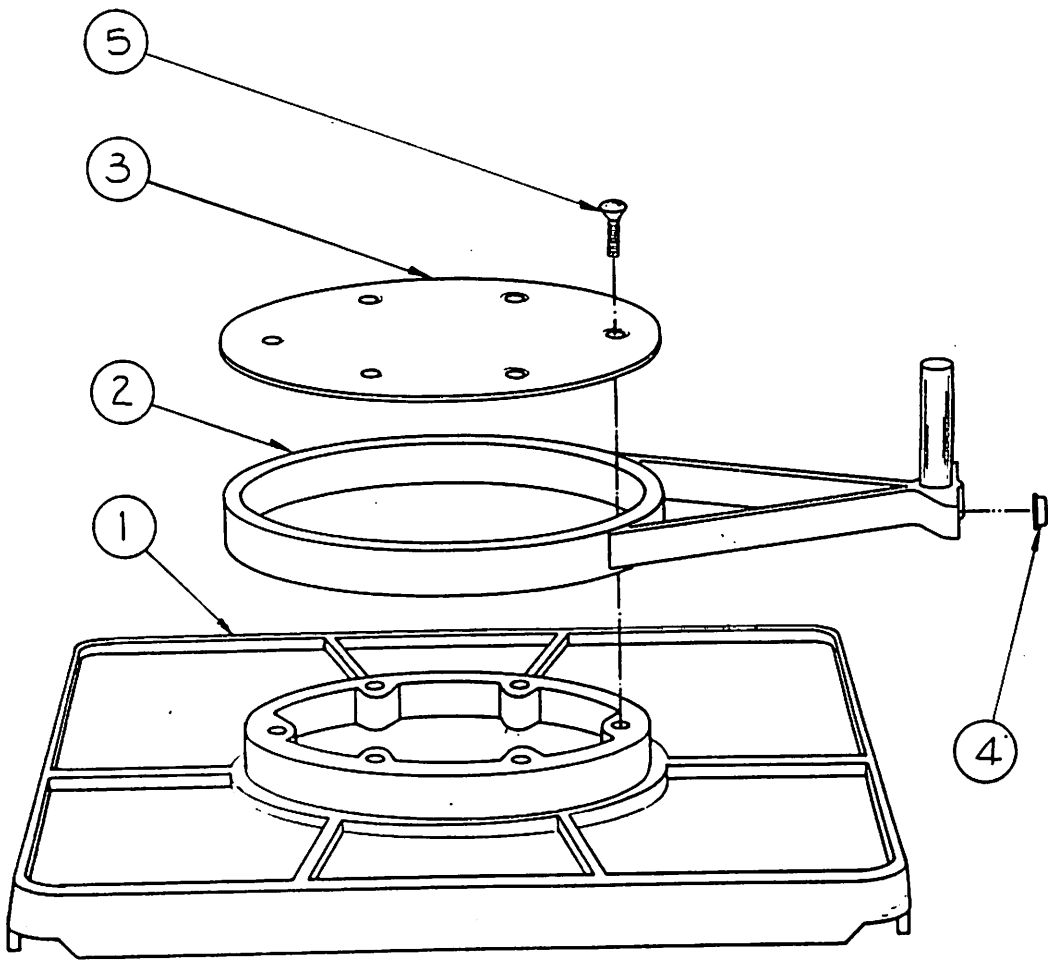


FIGURE 6.14 MONITOR SHELF UNIT, PARTS LOCATION DIAGRAM

TABLE 6.14 MONITOR SHELF UNIT, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		MONITOR SHELF UNIT	78 165 80
1		SHELF, MONITOR, PLASTIC	78 155 15
2		ARM, SHELF, MOUNTING	78 165 16
3		DISC, RETAINING, PLASTIC	78 165 21
4		BUMPER 78 102 65	
5		SCREW, #8-32 x 3/8 OV PH SS NYLOCK	99 031 48

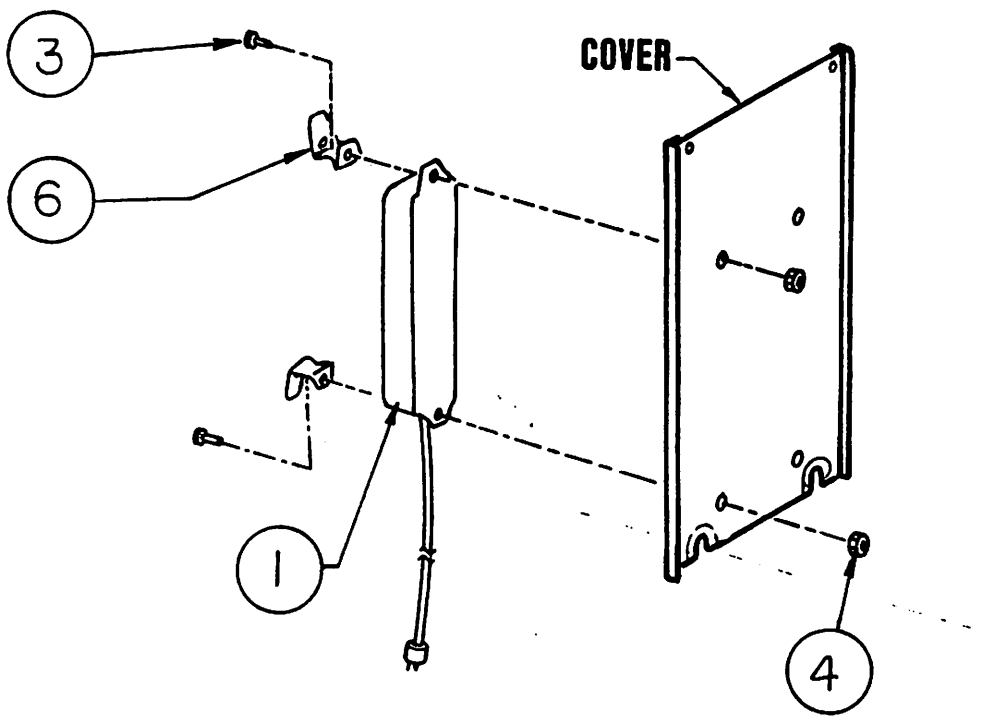


FIGURE 6.15 AC RECPTACLE BOX ASSEMBLY, PARTS LOCATION DIAGRAM

TABLE 6.15 AC RECEPTACLE BOX ASSEMBLY, PARTS LIST (ACCESSORY)
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		AC RECEPTACLE BOX ASSEMBLY	78 446 70
1		POWER OUTLET STRIP, 6 RECEPT, MODIFIED	17 732 56
2		NOT USED	
3		SCREW, 8-32 x 1/2 TR PH SS	99 031 99
4		NUT, HEX, 8-32 FLEXLOCK, THIN, S, Z1	99 106 03
5		NOT USED	
6		BRACKET, CORD RETAINING	78 446 05

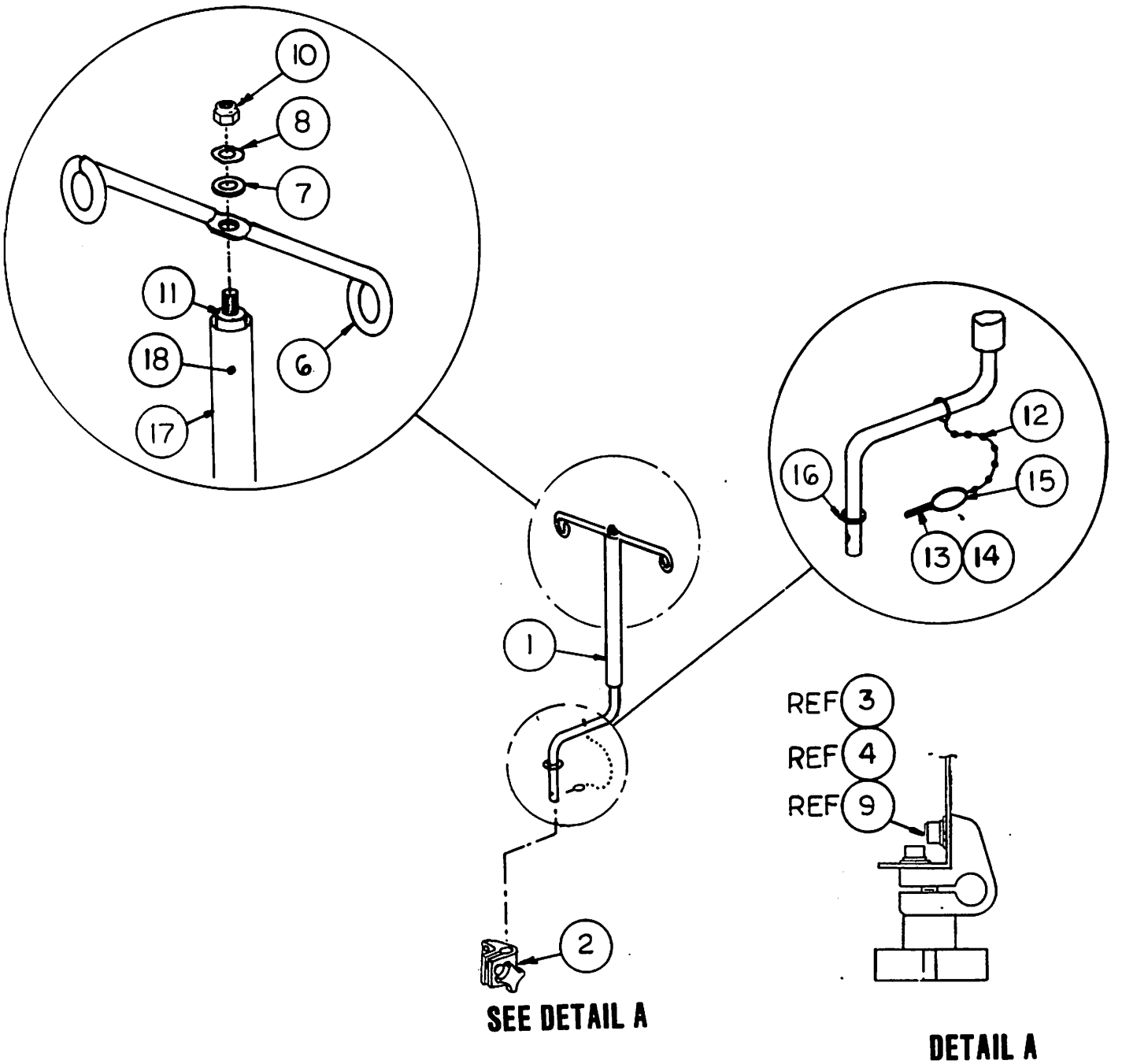


FIGURE 6.16 I.V. POLE, 1-INCH DIAMETER, PARTS LOCATION DIAGRAM

TABLE 6.16 I.V. POLE, 1-INCH DIAMETER, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		I.V. POLE, 1-INCH DIAMETER, WITHOUT PIVOT BRACKET	78 166 71
-		I.V. POLE, 1-INCH DIAMETER, WITH PIVOT BRACKET	78 166 72
1		I.V. POLE ASSEMBLY, 1.00 DIA	78 166 76
2	*	PIVOT BRACKET ASSEMBLY, LOCKING	78 930 95
3		SCR, 10-24 x 3/8 LG, CP SK, SS	99 047 53
4		WSHR, #10, LK, SP, S, CA	99 124 16
5		NOT USED	
6		CROSS ARM, I.V.	26 822 00
7		WSHR, 1/4, FL, SS	99 125 24
8		WSHR, SPR, CURVED, 25 ID x 50 OD x .010	99 125 63
9		WSHR, #10, FL, SS	99 123 62
10		NUT, 1/4 - 20, ES, SS	99 109 27
11		I.V. POLE ROD	78 166 00
12		BEAD CHAIN, No. 6	26 663 05
13		SPACER, .171 I.D. x 1/4 O.D. x 3/8" LG NYLON	99 123 36
14		COUPLING, OFFSET, bead chain	26 662 05
15		BALL DETENT PIN WITH RING	78 166 05
16		RETAINING RING, SS, 5100-50	99 182 65
17		ADAPTER, 1.00 DIAMETER (INCLUDES ITEM 18)	78 930 91
18		SET SCR, 1/4-20 x 1/4" SE SK SS CP	99 054 15

* Includes Items 2, 3, 4 and 5

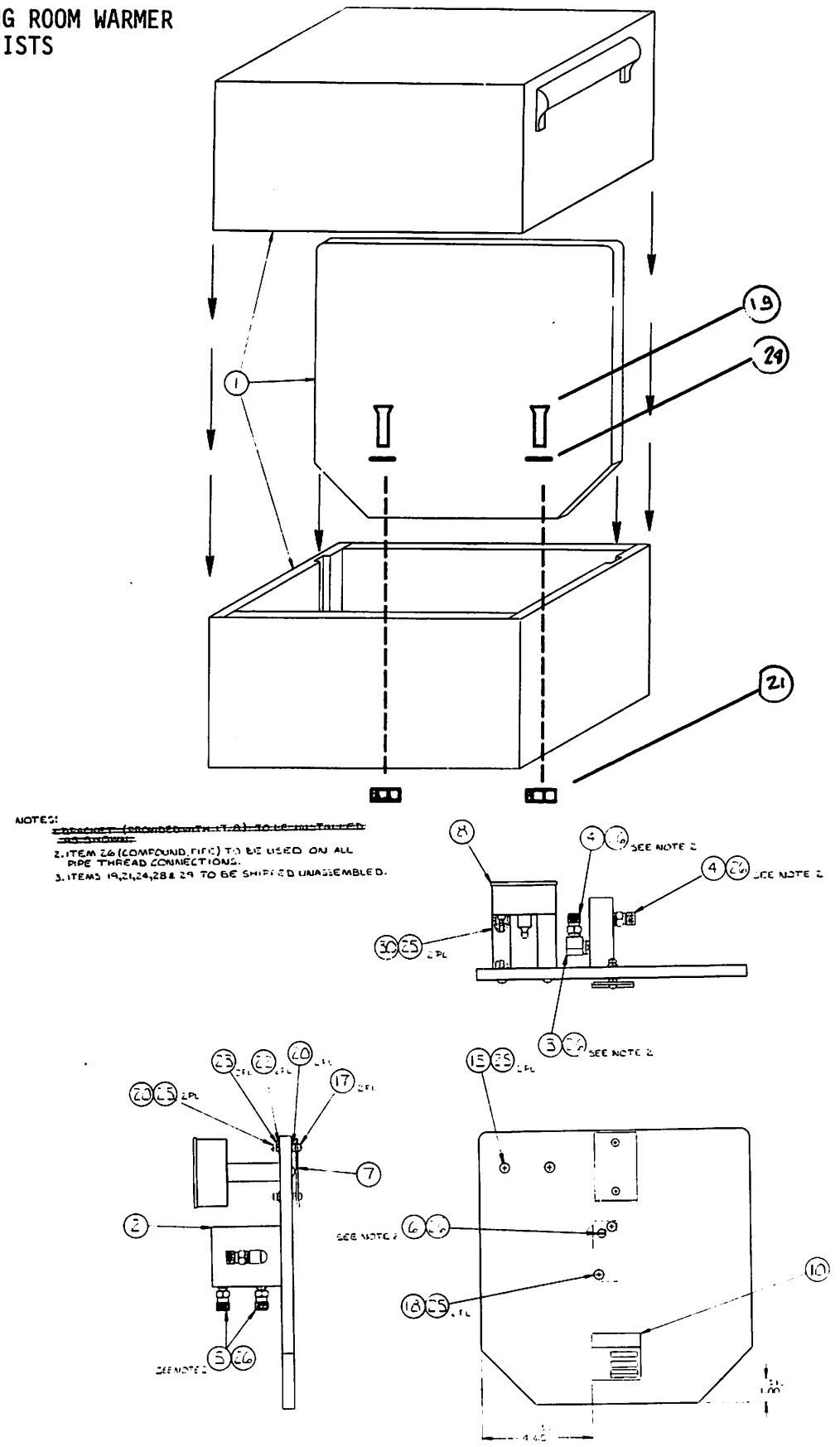
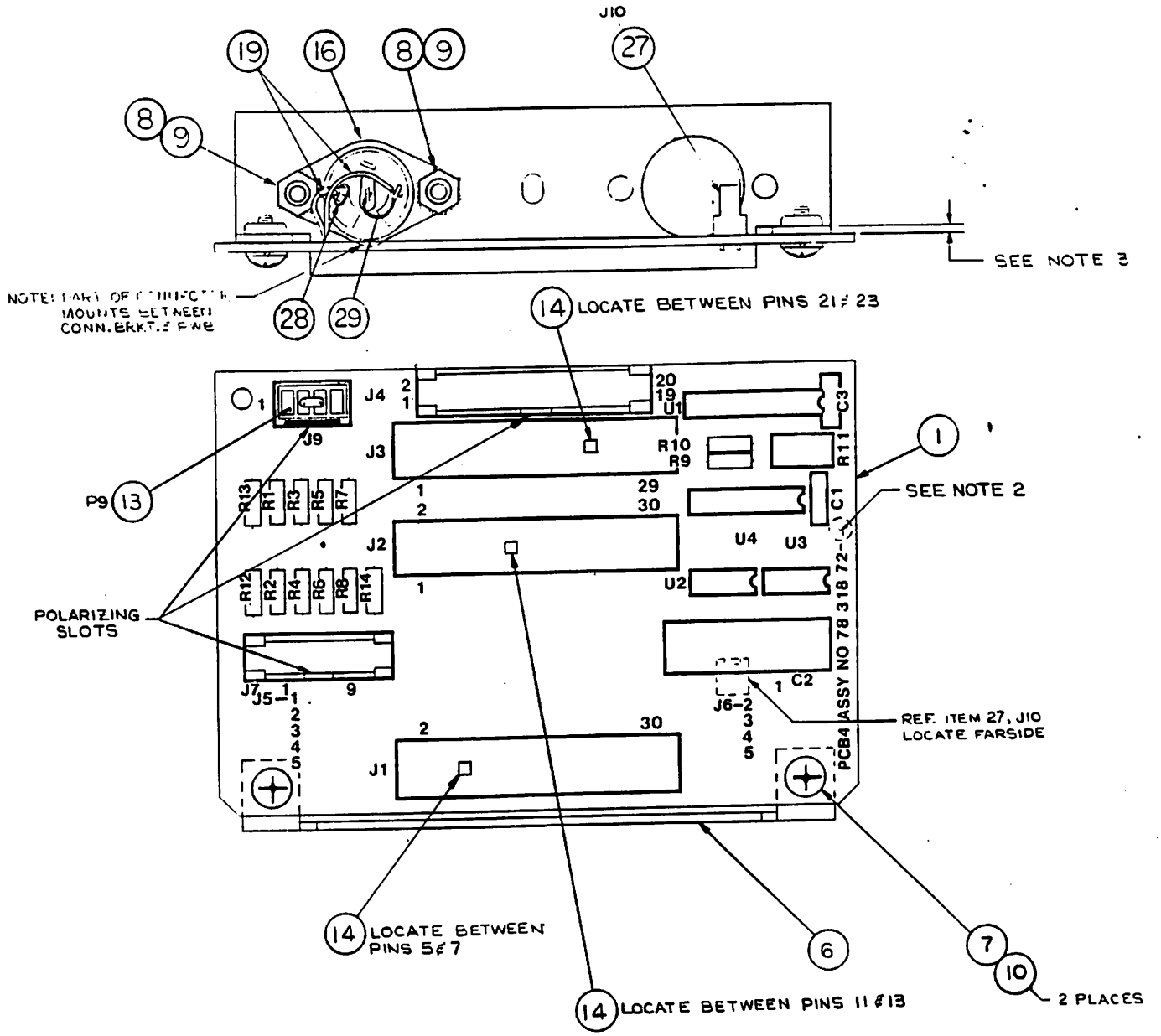

NOTES:
2. ITEM 26 (COMPOUND, PIPE) TO BE USED ON ALL PIPE THREAD CONNECTIONS.
3. ITEMS 19,21,24,28 & 29 TO BE SHIPPED UNASSEMBLED.
SEE NOTE 2
SEE NOTE 2
SEE NOTE 2
SEE NOTE 2
SEE NOTE 2
SEE NOTE 2
SEE NOTE 2
EPL
EPL
EPL

TABLE 6.17 RESUSCITATION BOX, PARTS LIST
(Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		RESUSCITATION BOX	78 456 75
1		RESUSCITATION ENCLOSURE, COMPLETE	78 291 30
2		MANIFOLD, O_2	78 456 10
3		ELBOW 90° MALE/FEMALE 1/4 NPT	78 456 01
4		FITTING DISS MALE x 1/4 NPT MALE	78 435 31
5		CHECK VALVE 1/8 NPT MALE, DISS	78 456 11
6		PLUG, PIPE 1/8 NPT	45 203 51
7		PLATE, GAUGE MOUNTING	78 462 00
8		GAUGE, PRESSURE -10 TO +60 cmH_2O	20 015 01
9		NOT USED	
10		NOT USED	
11		NOT USED	
12		NOT USED	
13		NOT USED	
14		NOT USED	
15		SCR, 10-32 x 1.00 LG, TR, PH, SS	99 043 47
16		NOT USED	
17		SCR, 6-32 x 7/8 LG, RD, PH, SS	99 024 91
18		SCR, 10-32 x 3/4 LG, FL, PH, SS	99 042 90
19		SCR, 1/4-20 x 1.00 LG, PN, PH, SS	99 057 67
20		NUT, #6, SS	99 105 02
21		NUT, HEX 1/4-20, KEPS, S, CA	99 109 41
22		WASHER, #6, FL, SS	99 122 03
23		WASHER, #6, LK, SP, SS	99 122 16
24		WASHER, 1/4 ID x 1/2 OD, FL, SS	99 125 23
25		LOCTITE 271	99 900 03
26		COMPOUND, PIPE	99 902 84
27		BAG, POLYETHYLENE 18 x 24	99 900 47
28		LABEL, DOCKING (English)	78 291 40
29		NOT USED	
30		STANDOFF, RESUSCITATION BOX	78 456 12
31		200 ML TWIN-O-VAC JAR	78 404 35



NOTES:

1. ASSEMBLY OF BOARD TO CONFORM WITH SPEC. NO. 00 945 12.
2. MARK ASSEMBLY REVISION LEVEL IN AREA SHOWN WITH .09 ± .03 HIGH CHARACTERS USING A PERMANENT SMUDGE-PROOF INK, COLOR TO CONTRAST WITH BOARD MATERIAL.
3. COMPONENT LEAD AND SOLDER BUILD UP NOT TO EXCEED .06 MAX. FROM SURFACE OF BOARD.
4. **CAUTION:** ASSEMBLY CONTAINS STATIC SENSITIVE DEVICES, SPECIAL HANDLING REQUIRED.

FIGURE 6.18 CONTROLLER MOTHERBOARD/SPEAKER ASSY. PCB4, MODEL CMB78-1 SERIES 02, PARTS LOCATION DIAGRAM

TABLE 6.18 CONTROLLER MOTHERBOARD/SPEAKER ASSY. PCB4, CONTROLLER MODEL CMB78-1 SERIES 02, PARTS LIST (Sheet 1 of 1)

ITEM NO.	REFERENCE DESIG.	DESCRIPTION	PART NUMBER
-		PCB4 ASSEMBLY, MOTHERBOARD	78 318 72
1		NOT USED	
2		NOT USED	
3		NOT USED	
4		NOT USED	
5		NOT USED	
6		BRACKET, CONNECTOR	78 318 25
7		SCR, 4-40 x 1/4, TR PH SS	99 010 56
8		WSHR, #4 LK SHE SS	99 121 37
9		NUT, No. 4, HX SS SMALL PATTERN	99 103 35
10		WASHER, NO. 4, LK SP SS	99 121 36
11	C1	CAP, .1 MF, 10% 50V	17 AY 646
12	J9	CONN, PC HDR LKG SGL ROW 4 POSN	17 BP 803
13	P9	PLUG ASSY, ALARM ENABLE	78 327 50
14		KEY, POLARIZING	17 BP 642
15	J1,2,3	CONN, RCPT CARDEDGE PC MTG	17 BP 632
16	J8	CONN, RCPT FEMALE 3 POSN	17 724 26
17	J4	CONN, RCPT MALE 20 CONTACTS	17 BP 653
18	J7	CONN, RCPT MALE 10 CONTACTS	17 732 34
19		WIRE SET	78 318 30
20	C3	CAP, 0.1 MFD, 10% 50V	17 AY 640
21	CR1	DIODE, 1N914	17 AR 500
22	U4	IC, CMOS 4x2 INPUT NAND 4011	17 629 77
23	U3	IC, PWR DRVR 3633	17 629 52
24	U2	IC, CMOS 3634 PERIPHERAL DRIVER	17 630 11
25	U1	IC, CMOS 12 STG BIN CNTR 4040	17 629 89
26	R12	RES, 69.8K 1% 1/8W FILM	17 AF 369
27	J10	CONN, PC HDR LKG SGL ROW 2 POSN	17 BP 801
28		SLEEVING, HT SHRK CLR .046 ID RCV	17 025 12
29		WIRE, BUSS 22 AWG SOLID COPPER	
30	R1	RES, 2K 1% 1/8W FILM	17 AF 221
31	R2,13	RES, 20K 1% 1/8W FILM	17 AP 317
32	R3,9,10	RES, 10K 1% 1/8W FILM	17 AF 288
33	R4	RES, 4.99K 1% 1/8W FILM	17 AF 259
34	R5	RES, 200K 1% 1/8W FILM	17 AF 413
35	R6,15	RES, 100K 1% 1/8W FILM	17 AF 384
36	R7,14	RES, 49.9K 1% 1/8W FILM	17 AF 355
37	R8	RES, 24.9K 1% 1/8W FILM	17 AF 326
38	R11	RES, VAR 50 OHM 6.5W, PCB HORIZ. ADJ.	17 AN 004
39		SPEAKER ASSEMBLY (NOT SHOWN AND NOT INCLUDED WITH PCB ASSY)	78 305 70

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SECTION 7
DIAGRAMS

7.1 GENERAL

This section provides schematics and wiring diagrams for the Air-Shields® Birthing Room Warmer, System 7865.

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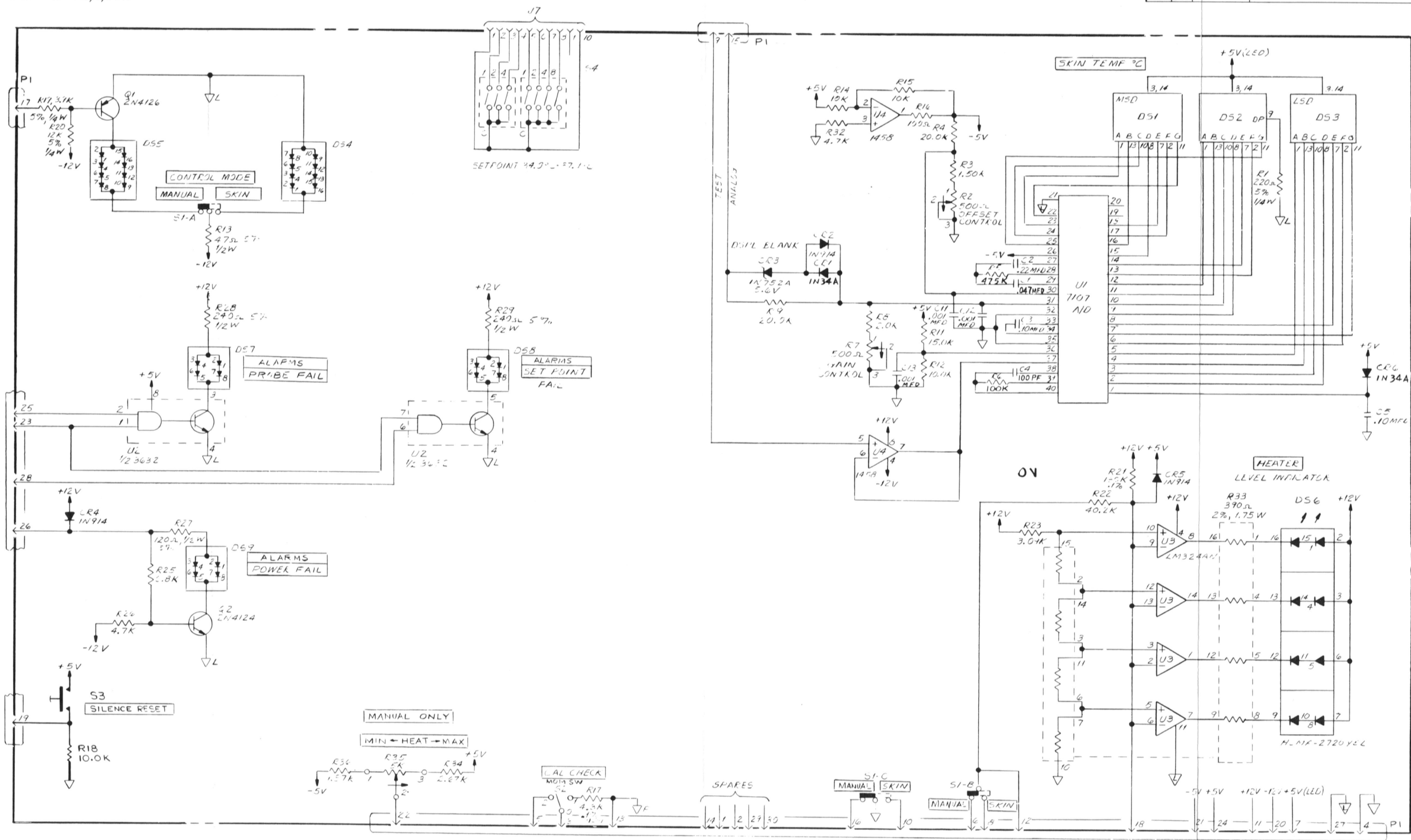
NOTES
1. UNLESS OTHERWISE SHOWN ALL RESISTORS ARE 1%, 1/8 W.



LAST ASSMNT USED	
USED	OMITTED
C13	C5,7,10
CR6	
DS1	
Q2	
R36	R10,24,30,31
S4	
U4	
P1	

KBE 19 1154 MC 3402

PARTS LIST

ITEM NO.	DWG SIZE	IDENT NO.	DESCRIPTION	QTY	U/M

REVISIONS

1. ISSUE OF N 907-27
JWT 24 MAR 83 RRR 5-19-83
2. ECN 6798
C1 WAS 1.72K
R34 WAS 1.76K
R36 WAS 2.94K
IN R ONE R4 DEL R30 & 31
JWT 22 JUN 83 6-27-83 CN
3. ECN 6888
C1 WAS .01MFD
C4 WAS .001 MFD
CR1 WAS IN914
CR6 WAS IN4001
R5 WAS 2.21M
R6 WAS 36.5K
TL 14 SEPT 83 11-15-83 CW
4. ECN 7553
24 FEB 84 R18 WAS CONN TO +5V, S3 WAS NORM CLOSED CONT TO GND
R18 5.1K 5% 11-7-85 RRR CW

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NEXT ASSY: 78 315 70			SCHEMATIC, DISPLAY, FCE I I.I.C.S. CONTROLLER
			SIZE D; FIGURE 7.1; SCALE NONE; SHEET 1 OF 1; DIST TO

NOTES:
1. UNLESS OTHERWISE SHOWN ALL RESISTERS ARE 1%. 1/8W.

°C	THERMISTOR
20	8573
21	8195
22	7836
23	7494
24	7170
25	6861
26	6567
27	6288
28	6022
29	5768
30	5527
31	5297
32	5078
33	4870
34	4671
35	4481
36	4300
37	4127
38	3962
39	3805
40	3655

SETPOINT SWITCH ASSEMBLY PCB1
34.0°C - 37.9°C

PCB2
(IICS) 78 316 71 (W W1,2)
(BRW) 78 316 72 (W/O W1,2)

MIN ← HEAT → MAX
PART OF PCB1

ALARM DELAY TIMER (15 SEC)

ALARM SILENCE TIMER (15 MIN)

CONTROL MODE
PART OF PCB1

SPARE

B RTHING ROOM WARMER DIAGRAMS

ITEM NO.	DWG SIZE	QTY	U/M

REVISIONS	
1. ISSUE ECN 7671	
RJH 11/10/87	KEK 4-2-87
2. ECN 8225 ZN 4-C1 ADDED PCB 2 78316/71 (W W1,2) 78316/72 (W/O W1,2).	
RJH 8/14/87	4-22-87 KEK
3. ECN 8077 ZN 4-C1 ADDED C29,C30	
RJH 2/17/88	3-15-88 KEK

I.C. NUMBERS	
NUMBER	REF DES
556	U6
1458	U1,2
3302	U3
4001	U14,19,20
4011	U16
4066	U4
4022	U15
4027	U7,8,16
4040	U10,17
4069	U5
4071	U12
4075	U11
4081	U13
4518	U9

LAST CMPNT USED	
USED	OMITTED
C30	
R33	R15
U20	
CR2	
P2	P1
W2	

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NEXT ASSY:
78 316 71
78 316 72

UNLESS OTHERWISE SPECIFIED – DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS ± —
DECIMALS .XX ± — .XXX ± —
ANGLES ± —
ALL SURFACE FINISH √MAX.
DO NOT SCALE DRAWING
MATERIAL —

SIGNATURES		DATE
DRAWN	R. Hoffman	4 MAR 87
CHKD		
ENG	Jon Kramer	4-2-87
APVD	[illegible]	9 APR 87
FINISH	—	

NARCO AIR-SHIELDS
A DIVISION OF NARCO SCIENTIFIC
HATBORO, PA. 19040, U.S.A.

SCHEMATIC, PCB 2, MEASUREMENT/DIGITAL, IICS/BRW CONTROLLER

SIZE D | FIGURE 7.2

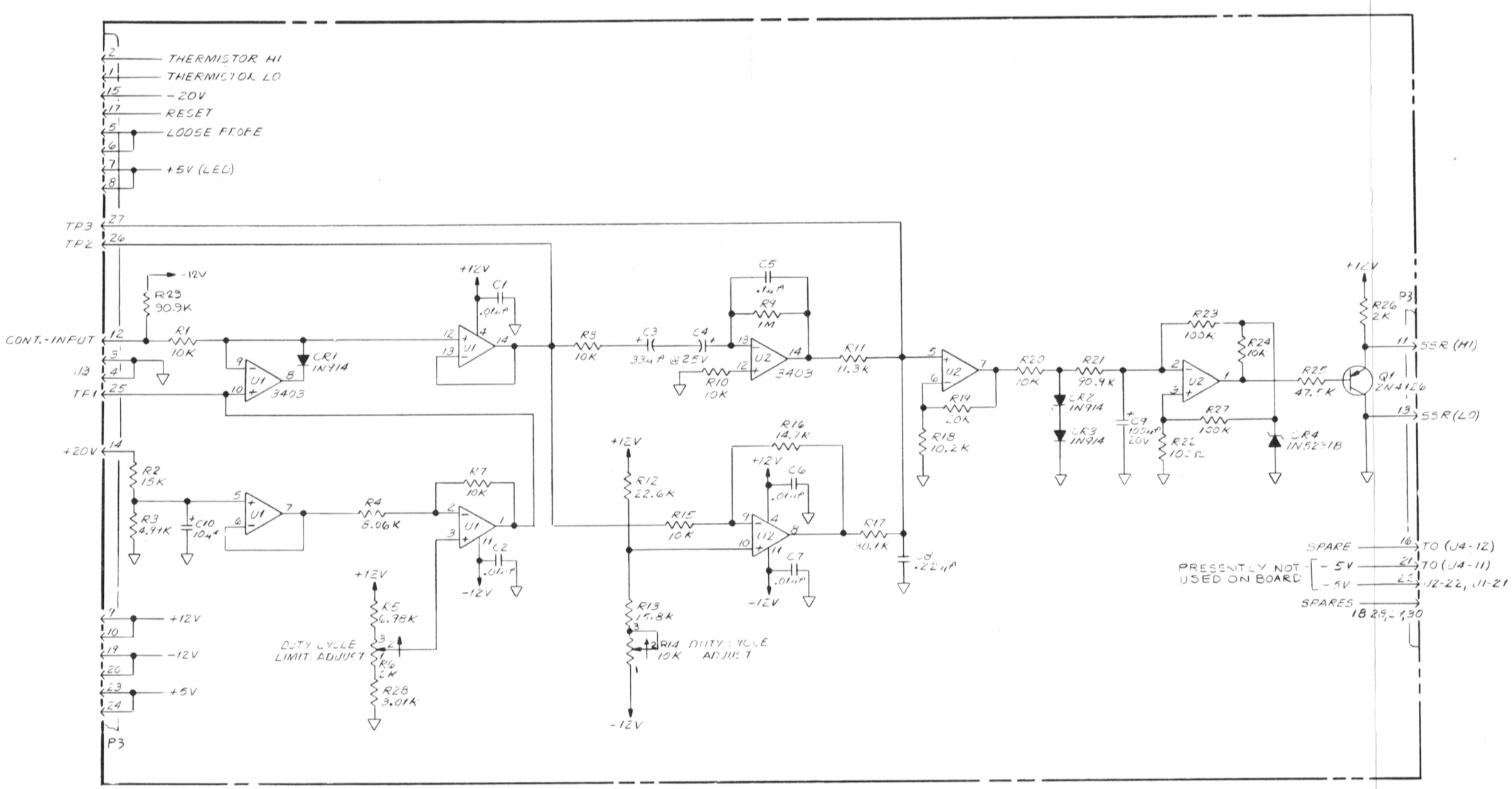
SCALE NONE | 7-4 SHEET 1 OF 1 | DIST TO

R&E 19 1154 MC 3402

NOTES:
1. UNLESS OTHERWISE SHOWN ALL RESISTORS ARE 1%, 1/8 W.

PARTS LIST					
ITEM NO.	DWG SIZE	IDENT NO.	DESCRIPTION	QTY	U/M

REVISIONS
1 ISSUE PRN 709-27 22 MAR 83 APP 5-18-83
2 ECN 7215 24 OCT ADDED R25



LAST CMPNT USED	
USED	OMITTED
C10	
CR4	
P3	P1, 2
U1	
R23	
U2	

OY

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NEXT ASSY: 78317 70

UNLESS OTHERWISE SPECIFIED – DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS ± — DECIMALS .XX ± — .XXX ± — ANGLES ± —
ALL SURFACE FINISH — √ MAX.
DO NOT SCALE DRAWING
MATERIAL —

SIGNATURES	DATE
DRAWN	22 MAR 83
CHKD	13 MAY 83
ENG	5-18-83
APVD	5/19/83
FINISH —	

NARCO AIR-SHIELDS
A DIVISION OF NARCO SCIENTIFIC
HATBORO, PA. 19040, U.S.A.

SCHEMATIC, CONTROL PCB 3

SIZE D | FIGURE 7.3

SCALE NONE | SHEET 1 OF 1 | DWG NO 70

NOTES:
1. UNLESS OTHERWISE SHOWN ALL RESISTORS ARE 1%, 1/8 W.
2. ☐ PRESENTLY NOT USED ON MATING P.C.B.

T1 PATIENT PROBE

PART OF PCB 1
SETPOINT 34.0°C-37.9°C
FOR REFERENCE ONLY

J7 2K 20K 10K 4.17K 200K 100K 49.9K 24.9K SPARE

J8 J5-1 J5-3 J6-4 J5-4 J5-2

J1 CAL SW. (ARM) CAL S.W. (N.C.) S1-B (MAN) +5 (LED) S1-B (SKIN) DISPLAY TEST S1-C (SKIN) +12V S1-B (ARM) ANALOG S1-C (MAN) LAMP DRIVE HTR LEVEL RESET -12V -5V MAN. POT (ARM) MOD. LAMPS +5V PROBE FAIL LAMPS PWR FAIL SET PT LAMP

S.R. J2 LOOSE PROBE CONTROL INPUT AUDIO MOD. AUDIO RELAY DRIVE

J3 TP1 TP2 TP3

J4 +5V (LED) +12V -20V -5V SPARE -12V +5V PWR FAIL RELAY DRIVE

RIBBON CABLE TO POWER MODULE

R11 680, 5% 1/4W

DS1 R9 3.9M 5%, 1/4W C1 .001mf R10 47K 5% 1/4W U1 4049

CR1 IN914 CR2 IN914

1/2 3634 U2-A U2-B 1/2 3634

+12 R13 20.0K +12 J9 P9

R12 69.8K R14 49.9K

REMOTE ALARM BOARD

NO

LAST CMPNT USED	
USED	OMITTED
C1	
CR2	
DS1	
J9	
R13	
T1	
U2	
TP3	

PARTS LIST					
ITEM NO.	DWG SIZE	IDENT NO.	DESCRIPTION	QTY	U/M

REVISIONS
1. ISSUE ECN 1154

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NEXT ASSY: 18 310 71

UNLESS OTHERWISE SPECIFIED — DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS ± — DECIMALS .XX ± — .XXX ± — ANGLES ± —
ALL SURFACE FINISH — √ MAX.
DO NOT SCALE DRAWING
MATERIAL —

SIGNATURES	DATE
DRAWN	
CHKD	
ENG	
APVD	
FINISH —	

NARCO AIR-SHIELDS HATBORO, PA. 19040, U.S.A.
A DIVISION OF NARCO SCIENTIFIC

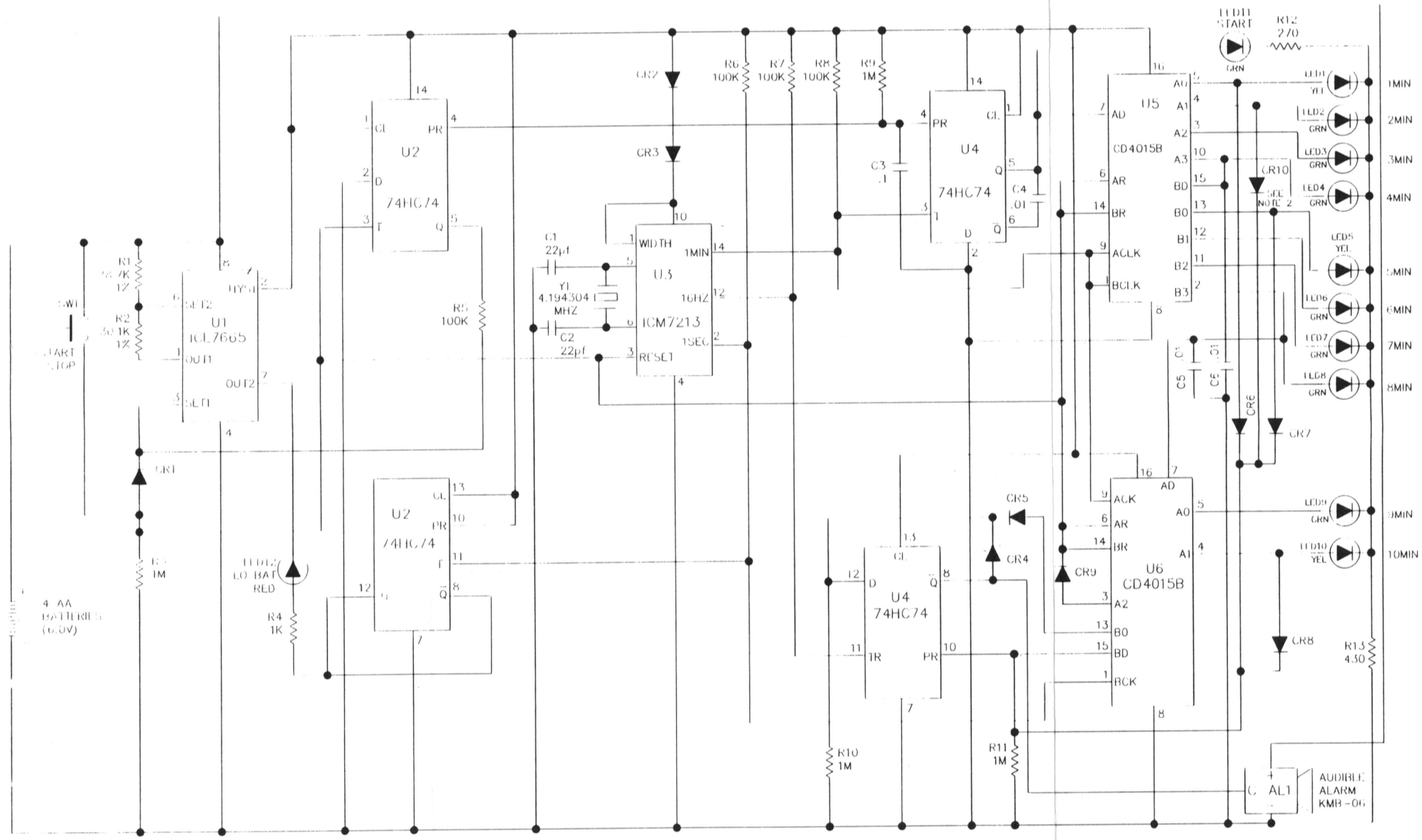
SCHEMATIC, MOTHER BOARD PCB 4, 11CS1BRW

SIZE D FIGURE 7.4 1

SCALE NONE SHEET 1 OF 1

DIST TO

K&E 10 1184 MC 3402+



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE 1/4W,5%(R607)
   ALL CAPACITANCE IN MICROFARADS
   ALL DIODES ARE 1N4148
2. CR10 IS INSTALLED FOR OPTIONAL 2 MINUTE BEEP.

SCHEMATIC DIAGRAM
APGAR TIMER

FIGURE 7.5

NOTES:
1. UNLESS OTHERWISE SHOWN ALL RESISTORS ARE 1%, 1/8 W.

LAST CMPNT USED	
USED	OMITTED
HT1	
J6	
CB2	
CR1	CR4
NTR1	
J12	J3, J4
K2	
Q1	
R12	
S3	
T2	
VR3	
XVR3	
DS1	
FL2	
TP4	

PARTS LIST					
ITEM NO	DWG SIZE	IDENT NO	DESCRIPTION	QTY	U/M

REVISIONS
1. ISSUE PEN 909-27 (M. MAR 83 / CCR S. 433)
2. ECN 7038 (A6) ADD "FL1"; (B7) DELETE "CB2"; (C7) ADD 230 VAC CAPABILITY (3-3 MAR 83 / CCR 433)
3. ECN 7025 (BLOWN FUSE LED; BROWN-OUT PROTECTION; SURGE PROTECTION; SUPPLY VOLTAGE MONITOR) (M. MAR 83 / K. K. 33 ACR)
4. ECN 7105 ADDED R13, C7, C8, C9, J11, J12. ADDED TP1, 2, 3, 4. C2 & C3 WERE 50µF. C3 WAS 4.7µF. RELOCATED VR1, 2 & 3. VR1 WAS 78M12UC. VR2 WAS 78M05UC. VR3 WAS 79M12AUC. PCB ASSY NO. WAS 78320-70-1 (SLT 1CC) CR4 (12 DEC 84 / K. K. 33 ACR)
5. DRN 8903 (A5&6) ADD NOT USED ON 78285-70 CALLOUT TO PHOTOTHERAPY. RELOCATED THERMAL CUTOUT OF T1 FROM WHT TO BLK SIDE OF WINDING. (CG) (5 JUL 85 / 5-19-85)
6. ECN 8010 (A&B) ADD LINE FILTER FL2 TO 230 VAC SCHEMATIC (5-3-87 / [illegible])

D
C
B
A

8 7 6 5 4 3 2 1

VR1 (+12.6V) LM317MPTE IN ADJ OUT
VR2 (+5V) LM317MPTE IN ADJ OUT
VR3 (-12V) LM337MPTE IN ADJ OUT
XVR1 XVR2 XVR3
J8 J9 J7 J6 J10 J12 J11 J5
CR1 IN914 R1 8.66K CR2 IN914
BT1 7.2V NOMAN
FLEG. POSN
R3 1.02K R2 124Ω R8 219Ω R7 124Ω R11 97.6Ω R10 124Ω
T1 BLK BN/VL RED RD/VL RD/BK WHT
CR3 1.5A
C1 1000µf 35V
R5 200Ω +12.6V ADJ C2 10µf 25V
R9 200Ω +5V ADJ
R12 200Ω -12V ADJ. C3 10µf 25V
C4 1000µf
CR5 IN4001 CR6 IN4001
C6 1000MFD
TP3O +12.6V TP2 +5V TP1 GND TP10 -12V
C5 50µf 25V
PWR FAIL +20 +12.6 +5 -20 -12 +5 (LED) RELAY DRIVE -5 SPARE SSR HI SSR LO
RIBBON CABLE TO CONTROLLER VIA P4 SEE SCHEMATIC 78-319-19
Q1 2N4126 R4 3.74K R5 12.1K CR7 IN4001 K1 1A/12VDC
PLUG POSN
PCB ASSY 78320-71 POWER SUPPLY PCB
A2 SSR
POWER MODULE
P2 J12 N/U HTR1

100/115 VAC
CB1 13A
AC INPUT 115VAC
BRN BLU GRN/YEL GND
AC INPUT 230V.
J1 CB1,7A W BRN BRN CB2,7A W BLU BLU CB1 GRN/YEL GND
FL2
FLT S1
WARMER ON/OFF
EXAMINATION LIGHT
PHOTOTHERAPY
T2 PRI SEC 12 VAC 6.3 VAC
DS1 EXN 50W
NAMES HOLDERS
CHART ECN 78-285-70 & 78-210-70

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NEXT ASSY:		DRAWN [illegible]	22 MAR 83
		CHKD [illegible]	3 MAR 83
		ENG [illegible]	5-18-83
		APVD [illegible]	5/19/83
		FINISH ——	

NARCO AIR-SHIELDS
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HATBORO, PA. 19040, U.S.A.

SCHEMATIC, POWER MODULE / WARMER HOUSING, I.I.C.S. D.R.W. & B.R.W.

SIZE D | FIGURE 7.6 | SCALE NONE | SHEET 1 OF 1 | REV 10

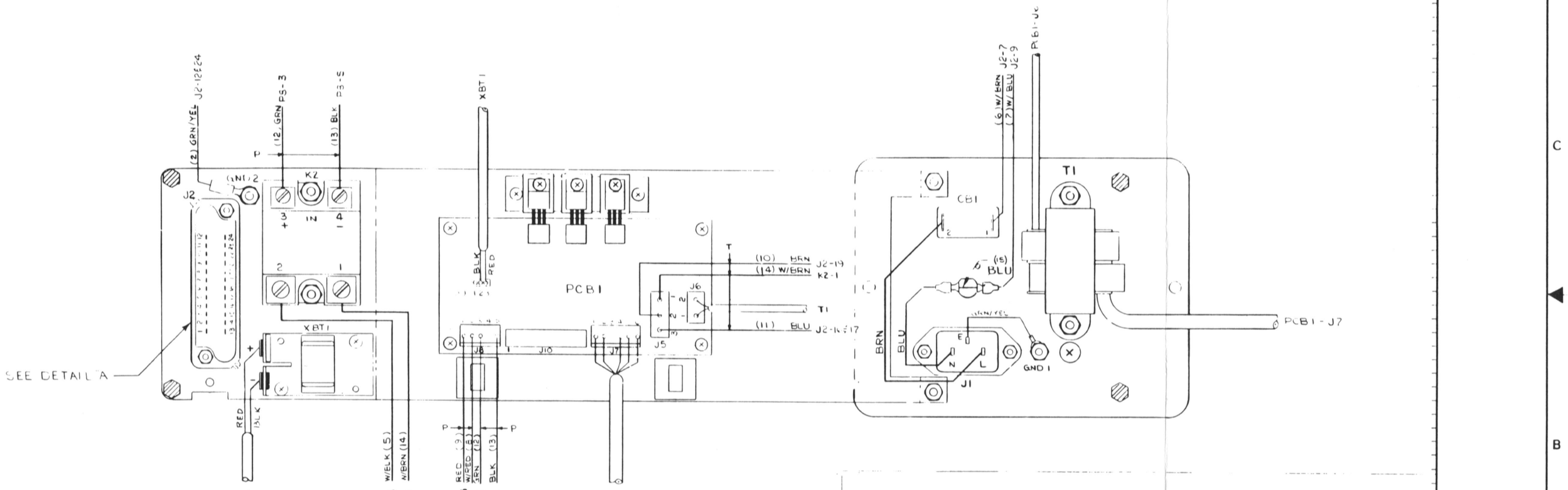
NOTES:
1. FOR SCHEMATIC SEE DWG NO. 78 306 00.
2. FOR WIRE LIST SEE DWG NO. 78 992 95.
3. NUMBERS IN PARENTHESIS ( ) ARE WIRE NUMBERS FROM WIRE LIST.

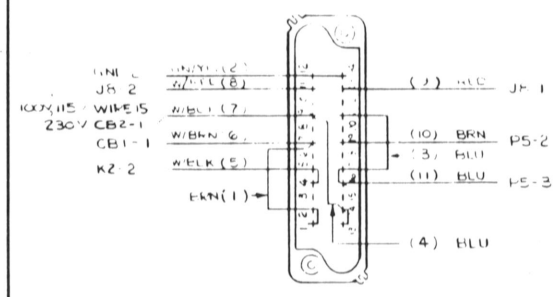
PARTS LIST

ITEM NO.	DWG SIZE	IDENT NO.	DESCRIPTION	QTY	U/M

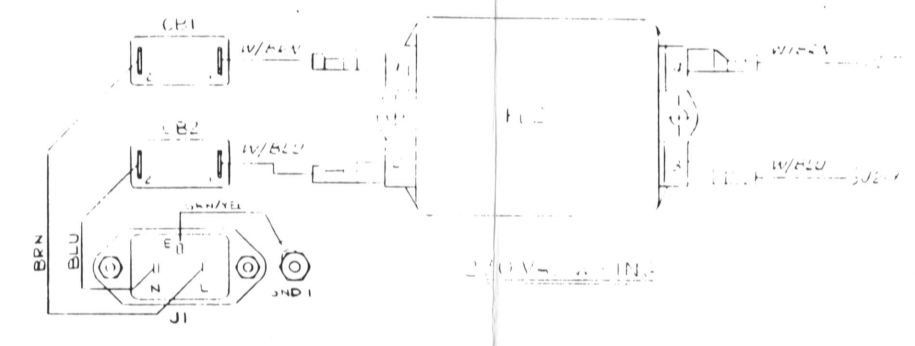
REVISIONS

1. ISSUE (ECN 90)-15
2. ECN 0771 CHANGE CB-1 TO K2 WAS K1
3. ECN 0993 (A&B) ADD 4 PIN PLUG (C) ADD 2 WIRES (D) DELETE WIRE (E) ADD 2 WIRES DETAIL A: ATTACH WIRE 7 ADD WIRE 8 FOR 115V. ADD 230V.
4. ECN 1111 ADD 2 PL FL111 FILTEL FL2 TO 230 VAC UNIT





DETAIL "A"



THIS DOCUMENT IS PROPRIETARY INFORMATION. REPAIRS AND MODIFICATIONS SHOULD BE PERFORMED ONLY BY AUTHORIZED SERVICE PERSONNEL TO MAINTAIN YOUR WARRANTY AND TO AVOID CREATING SAFETY HAZARDS. WE CAN NOT ASSUME RESPONSIBILITY FOR ANY CONDITIONS AFFECTING THE PROPER OPERATION OF THIS EQUIPMENT WHICH MAY RESULT FROM UNAUTHORIZED REPAIR OR MODIFICATION

NEXT ASSY:

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES
.XX
.XXX
ALL SURFACE FINISH √MAX.
DO NOT SCALE DRAWING
MATERIAL

SIGNATURES		DATE
DRAWN	[illegible]	11 NOV 82
CHKD	[illegible]	20 DEC 82
ENG	[illegible]	12-27-82
APVD	[illegible]	2 JAN 83

FINISH

NARCO AIR-SHIELDS
A DIVISION OF NARCO SCIENTIFIC
HATBORO, PA 19040 U.S.A.

DIAGRAM, WIRING, POWER MODULE

SIZE D | FIGURE 7.7 | SHEET 1 OF 1 | SCALE 1:1 | DIST TO 1

BIRTHING ROOM WARMER DIAGRAMS

LAST COMPONENT USED	
USED	OMITTED
C1	
CR1	
DS1	
J10	
P10	
R15	
RT1	
TP3	
U4	

REVISIONS

2. ECN 8872 REVISED & REDRAWN U3B WAS U4D, U4D WAS U3B, ADDED R15, CR1, ADD "L" AND TO J4-4 & J9-3, U1-11 WAS CONN. TO GND ⏚.	
RJH 29 AUG-89	9-5-89 REA

PATIENT PROBE
SHLD RT1
P8 1 2 3
J8 1 2 3

P7 J7
R1 2K
R2 20K
R3 10K
R4 4.99K
R5 200K
R6 100K
R7 49.9K
R8 24.9K
SPARE
SPARE

PART OF PCB1
SET POINT 34.0 C / 37.9 C
FOR REFERENCE ONLY

J5-1 J5-3
J6-1 J6-2 J6-3 J6-4 J6-5 J5-2 J5-4 J5-5
NC NC NC NC NC

J1
CAL. SW. (ARM)
CAL. SW. (N.C.)
S1-B (MAN)
+5V (LED)
S1-B (SKIN)
DISPLAY TEST
S1-C (SKIN)
+12V
S1-B (ARM)
ANALOG
S1-C (MAN)
LAMP DRIVE
HTR LEVEL
RESET
-12V
-5V
MAN. POT. (ARM)
MOD. LAMPS
+5V
PROBE FAIL LAMPS
PWR. FAIL
SET PT. LAMP

J2
S.P
LOOSE PROBE
CONTROL INPUT
AUDIO
MOD. AUDIO
RELAY DRIVE

J3
TP1
TP2
TP3

RIBBON CABLE TO POWER MODULE
+5V (LED)
+12V
SSR (HI)
SSR (LO)
+20V
-20V
-5V
SPARE
-12V
+5V
PWR FAIL RELAY DRIVE

+12V
R13 20.0K
U2A 3634
U2B 3634
R14 49.9K
R12 69.8K
J9 P9
REMOTE ALARM RCPT.

R9 10K
R10 10K
C1 .1
C3 .01
U4B U4A U4C 4011
U1 4040
CLK RST Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12
U3B U3A 3633
R15 100K
CW VOLUME R11 50 OHMS
CR1 1N914
J10 P10
DS1 45 OHMS
U4D 4011 SPARE

PCB4
78 318 72

AIR-SHIELDS/VICKERS
330 JACKSONVILLE RD.
HATBORO, PA 19040
Title: SCHEMATIC, PCB4, IICS/BRW CONTROLLER
Size: D Docu: FIGURE 7.8 REV: 2
Date: August 29, 1989 Sheet 1 of 1

NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTANCE VALUES ARE IN OHMS, 1%, 1/8W.
2. CAPACITANCE VALUES ARE IN MICROFARADS
3. ☐ PRESENTLY NOT USED ON MATING P.C.B.